GE LABORATORIES

INSTRUCTION MANUAL

MP MASTER
MA34812

ROHDE&SCHWARZ
polarad

5 Delaware Dr., Lake Success, New York 11042 (516) 328-1100 TWX: 510-223-0414

ROHDE & SCHWARZ
polarad
Rohde & Schwarz-Polarad, Inc., 5 Delaware Dr., Lake Success, N.Y. 11042
Tel: 516-328-1100 TWX: 510-223-0414

INSTRUCTION MANUAL

MODULAR MICROWAVE SIGNAL GENERATORS MODELS 1107A AND 1108A

MODULAR MICROWAVE SIGNAL SOURCES MODELS 1207A AND 1208A

THIS HAND BOOK COVERS EQUIPMENT
MODEL 1107A SERIAL NO. 29-1 AND UP
MODEL 1108A SERIAL NO. 30-6 AND UP
MODEL 1207A SERIAL NO. 25-1 AND UP
MODEL 1208A SERIAL NO. 19-1 AND UP

polarad electronic instruments
A DIVISION OF POLARAD ELECTRONICS CORP.
5 DELAWARE DRIVE LAKE SUCCESS, NEW YORK, 11040 516-328-1100

1974

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_05435

TABLE OF CONTENTS

Paragraph		Page
	SECTION I - INTRODUCTION	
1-1	Scope of Manual	1-1
1-3	Purpose and Use of Instruments	1-1
1-4	Signal Generators, Models 1107A and 1108A	1-1
1-6	Signal Sources, Models 1207A and 1208A	1-1
1-10	General Description	1-1
1-12	Equipment Supplied	1-1
1-14	Equipment Specifications	1-1
1-16	Electron Tube Complement	1-1
1-18	Accessories for Polarad Signal Generators and Sources	1-5
	SECTION II - OPERATION	
2-1	General	2-1
2-3	Installation	2-1
2-6	Operating Procedures	2-1
2-8	Operating Controls, Indicators, and Connectors	2-1
2-9	Connection and Preliminary Operation	2-1
2-10	Operation with Internal Modulation	2-1
2-11	Operation with External Modulation	2-5
2-12	Automatic Frequency Stabilization	2-5
2-13	Operation with Other Modular Microwave Instruments	2-5
2-14	Packaging Instructions	2-5
2-15	Packaging for Short Term Storage	2-5
2-16	Packaging for Long Term Storage or Shipment	2-5
	SECTION III - THEORY OF OPERATION	
3-1	General	3-1
3-4	Block Diagram Analysis	3-1
3-9	Detailed Theory of Operation	3-1
3-10	Klystron Oscillator	3-1
3-13	Mode Switching	3-1
3-14	Repeller Voltage Tracking System	3-3
3-15	Protective Diode	3-3
3-16	Frequency Control Knob	3-3
3-17	Output Attenuator Knob	3-3
3-18	Power Set Knob (Models 1107A and 1108A only)	3-3
3-19	Power Monitor Operation (Models 1107A and 1108A only)	3-3
3-20	Schmitt Trigger Keyer	3-3
3-21	Transistorized Delay Circuit	3-3
3-22	Square Wave Generator	3-4
3-23	Modulation Selection	3-4
3-30	Beam Power Supply	3-4
3-31	Repeller Power Supply	3-4
3-32	Klystron Filament Supply	3-4
3-33	AC Filament Supply	3-4
3-34	Power Supply Adjustments	3-4

TABLE OF CONTENTS (Cont'd)

Paragraph		Page
	SECTION IV - MAINTENANCE	
4-1	General	4-1
4-3	Test Equipment Required	4-1
4-5	Preliminary Inspection	4-2
4-7	Minimum Performance Standards	4-2
4-9	Troubleshooting	4-2
4-11	Disassembly and Reassembly Instructions	4-2
4-13	Removal of Power Set Probe Assembly (Models 1107A, 1108A Only)	4-2
4-14	Replacement of Power Set Probe Assembly (Models 1107A, 1108A Only)	4-2
4-15	Removal of Attenuator Probe Assembly	4-11
4-16	Replacement of Attenuator Probe Assembly	4-11
4-17	Replacement of Klystron Oscillator Tube V11 (Models 1107A and 1207A)	4-11
4-18	Adjustment and Calibration Procedures	4-12
4-20	-1250 Volt Adjustment	4-12
4-21	-1750/-1850 Volt Adjustment	4-12
4-22	Beam Current Adjustment	4-12
4-23	Square Wave Symmetry Adjustment	4-13
4-24	Klystron Frequency Alignment	4-13
4-25	Repeller Voltage Tracking Adjustments	4-14
4-26	Power Output Check	4-14
4-27	Final Check	4-14
	SECTION V - SCHEMATIC DIAGRAMS	
5-1	General	5-1
	SECTION VI - PARTS LIST	
6-1	Introduction	6-1
6-3	Ordering Information	6-1
6-4	How to Use the Parts List	6-1
6-6	Reference Symbol Column	6-2
6-7	Description Column	6-2
6-8	Manufacturer's Part Number Column	6-2
6-9	Manufacturer's Code Column	6-2
6-10	Maintenance Quantity Column	6-2

LIST OF ILLUSTRATIONS

Figure		Page
1-1	Modular Microwave Signal Generator	iv
1-2	Oscillator and Phase Lock Power Outputs	1-2
2-1	Models 1107A, 1108A, 1207A, and 1208A, Outline Installation Drawing	2-2
2-2	Models 1107A, 1108A, 1207A, and 1208A, Operating Controls, Indicators, and Connectors	2-3
2-3	Models 1107A, 1108A, 1207A, and 1208A, Connections for Use	2-5
2-4	Packaging Diagram	2-6
3-1	Modular Microwave Signal Generators and Sources, Models 1107A, 1108A, 1207A, and 1208A, Block Diagram	3-2
4-1	Minimum Performance Standards Test Setups	4-6
4-2	Models 1107A, 1108A, 1207A, and 1208A Chassis, Top View	4-16
4-3	Models 1107A, 1108A, 1207A, and 1208A Chassis, Bottom View	4-17
4-3A	Models 1107A, 1108A, 1207A, and 1208A Chassis, Side View	4-19
4-4	Models 1107A, 1108A, 1207A, and 1208A Chassis, Rear View	4-20
4-5	Klystron Cavity, Exploded View, Models 1107A and 1207A	4-21
4-5A	Klystron Cavity, Exploded View, Models 1108A and 1208A	4-22
4-6	Test Setup for Klystron Frequency and Repeller Tracking Adjustment	4-23
4-7	Tuning Cam Adjustments	4-24
4-8	Mode Patterns	4-24
4-9	Typical Repeller Voltage Vs Frequency Characteristics, Models 1107A and 1207A	4-25
4-10	Typical Repeller Voltage Vs Frequency Characteristics, Models 1108A and 1208A	4-25
5-1	Model 1107A Modular Microwave Signal Generator, Schematic Diagram	5-3
5-2	Model 1108A Modular Microwave Signal Generator, Schematic Diagram	5-5
5-3	Model 1207A Modular Microwave Signal Source, Schematic Diagram	5-7
5-4	Model 1208A Modular Microwave Signal Source, Schematic Diagram	5-9
6-1	Parts List Example	6-1

LIST OF TABLES

Table		Page
1-1	Equipment Supplied	1-3
1-2	Equipment Specifications	1-3
1-3	Electron Tube and Transistor Complement	1-4
2-1	Operating Controls, Indicators, and Connectors	2-4
2-2	Modular Microwave Instrument Combinations	2-7
4-1	Test Equipment Required	4-1
4-2	Minimum Performance Standards, Models 1107A, 1108A, 1207A, and 1208A	4-3
4-3	Troubleshooting Procedure	4-7
4-4	Modulation Selector Switch S2 Positions and Circuits	4-15
5-1	Voltage and Resistance Measurements, Models 1107A, 1108A, 1207A, and 1208A	5-11
6-1	Manufacturer's Code	6-2
6-2	Parts List	6-3

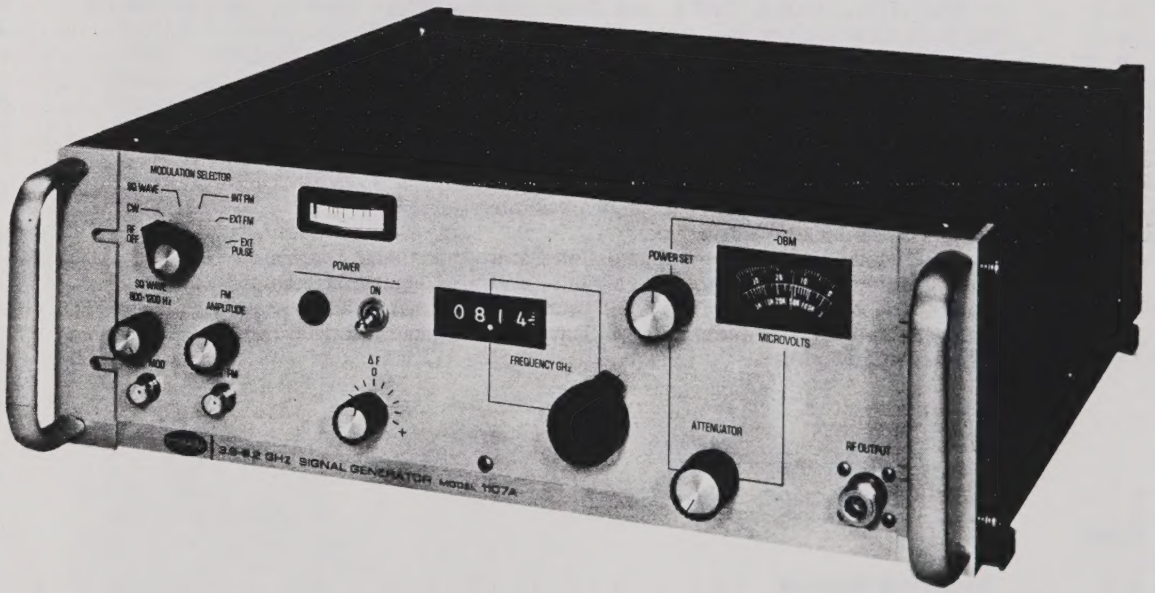


Figure 1-1. Modular Microwave Signal Generator

SECTION I

INTRODUCTION

1-1. SCOPE OF MANUAL.

1-2. This manual contains instructions for the use and maintenance of the Modular Microwave Signal Generators, Models 1107A (figure 1-1) and 1108A, and Signal Sources, Models 1207A and 1208A, manufactured by the Polarad Electronic Instruments Division of Polarad Electronics Corporation, Lake Success, New York. The manual includes a general description of the instruments, operating instructions, theory of operation, maintenance data, and a parts list.

1-3. PURPOSE AND USE OF INSTRUMENTS.

1.4. SIGNAL GENERATORS, MODELS 1107A AND 1108A. The ratings for available uncalibrated power output for Model 1107A are at least 25mw from 3.7-4.3 GHz, at least 15 mw from 5.0 - 8.2 GHz , and at least 10mw at other frequencies . The Model 1108A provides uncalibrated power output of at least 13 dbm (20 mw) from 6.95 to 8.00 GHz and at least +10 dbm (10mw) from 8.0 to 11.0 GHz. Calibrated output range is +6 dbm to -127 dbm. The range of the calibrated attenuator is +3 to -127 dbm with an absolute accuracy of ±2 db. The frequency range of the Model 1107A is 3.70 to 8.40 GHz and the frequency range of Model 1108A is 6.95 to 11.0 GHz. Typically more than rated power is available. However, when the Attenuator Control is adjusted for more than rated output levels, it is possible to overcouple the pick-up probe causing minor frequency shifts and, with excessive overcoupling, reduction of power output.

1-5. Typical uses of the Signal Generators are testing broad- and narrow-band microwave systems and components such as antennas, attenuators, beacons, crystal mounts, hybrid junctions, preselectors, radars, receivers, and traveling wave tube amplifiers. These instruments can also be used to make specific measurements of bandwidth, attenuation, alignment, frequency dial calibration, image rejection, sensitivity, power gain, VSWR, and other characteristics. They can also be used as a receiver local oscillator, modulated transmitter, or system microwave reference in checkout equipment.

1-6. SIGNAL SOURCES, MODELS 1207A AND 1208A. The Models 1207A and 1208A Signal Sources provide a maximum power output over their frequency ranges as shown in figure 1-2. The Signal Sources differ from the Models 1107A and 1108A Signal Generators in that their attenuators are not calibrated and their output impedances are very low. The frequency ranges of the Signal Sources are identical with those of the corresponding Models 1107A and 1108A Signal Generators.

1-7. Typical uses of the Signal Sources are in the investigation of antenna patterns and characteristics, measurement of attenuation, gain, insertion loss, Q, selectivity, frequency, and signal-to-noise ratio. They can also be used for alignment of communication and radar systems and components. When either Signal Source is used with the appropriate Frequency Doubler (Models 1509 and 1510, respectively), the combination provides all facilities of a signal generator at double the Signal Source frequency.

1-8. The Modular Microwave Signal Generators, Models 1107A and 1108A, and Signal Sources, Models 1207A and 1208A, incorporate phase lock provisions to increase their frequency stability when used with an external oscillator synchronizer.

1-9. The Modular Microwave Signal Generators, Models 1107A and 1108A, and Signal Sources, Models 1207A and 1208A, incorporate provisions for external motor drive. The tuning shaft extends through the rear of the instruments for this purpose.

1-10. GENERAL DESCRIPTION.

1-11. The Modular Microwave Signal Generators, Models 1107A and 1108A, and Signal Sources, Models 1207A and 1208A, which hereafter will be referred to by model number, are identically-sized, self-contained, compact instruments suitable for bench or rack use. The instruments are line-powered and consist of a panel, a frame or chassis, and dust covers. The panel serves as a mounting for the controls, connectors, and power level monitoring meter (1107A and 1108A only). The handles at either end of the panel are reversible for bench or rack use. The dust covers, which are side, top, and bottom panels, enclose and protect the internal components of the instrument.

1-12. EQUIPMENT SUPPLIED.

1-13. Table 1-1 lists the equipment supplied for the Models 1107A, 1108A, 1207A, and 1208A instruments.

1-14. EQUIPMENT SPECIFICATIONS.

1-15. Table 1-2 lists the equipment specifications for the Models 1107A, 1108A, 1207A, and 1208A instruments.

1-16. ELECTRON TUBE COMPLEMENT.

1-17. Table 1-3 lists the electron tube complement of Models 1107A, 1108A, 1207A, and 1208A.

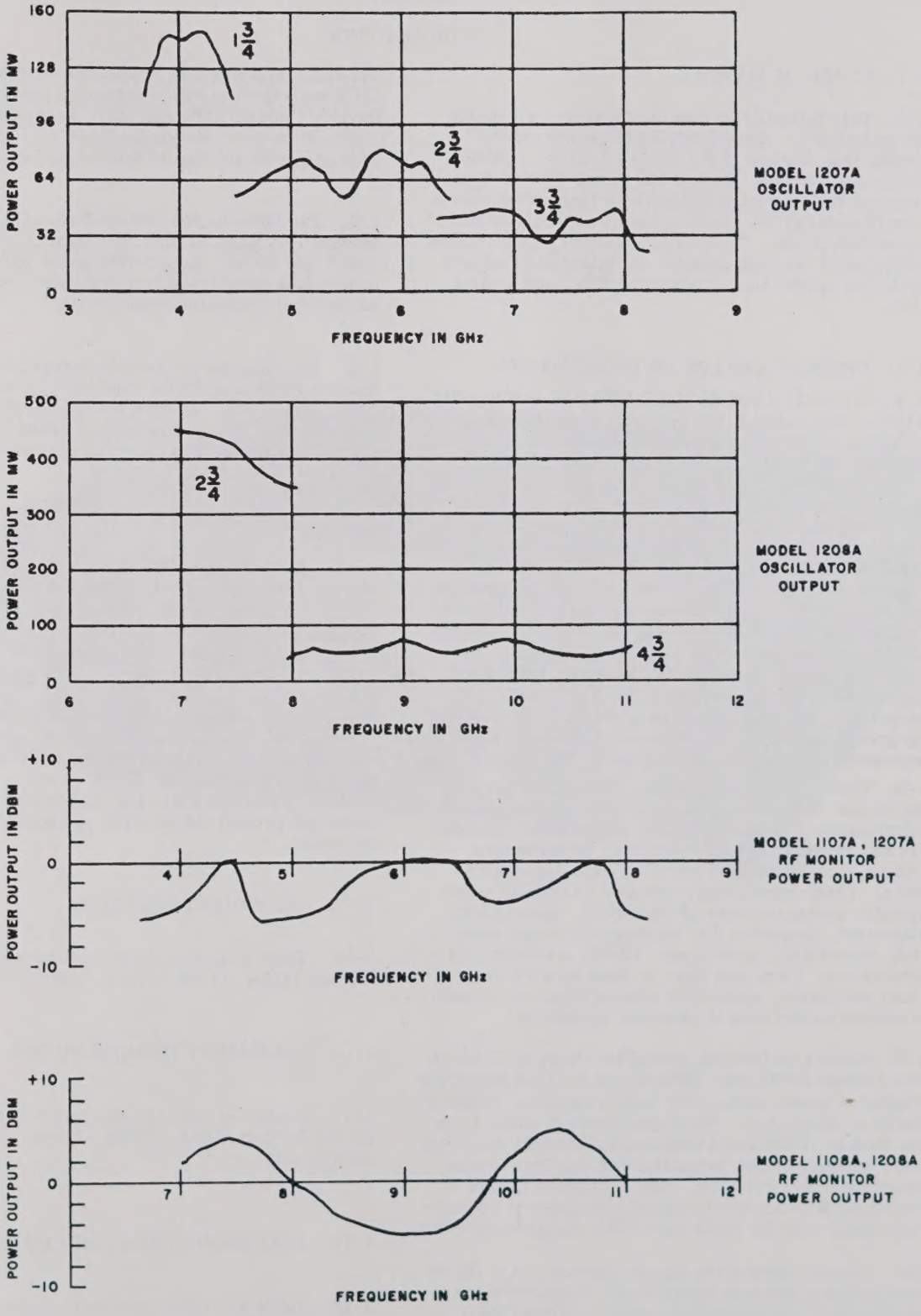


Figure 1-2. Typical Oscillator anf RF Monitor Power Outputs

TABLE 1-1. EQUIPMENT SUPPLIED

Name	Polarad Model or Part No.
Modular Microwave Signal Generator	1107A 1108A
Modular Microwave Signal Source	1207A 1208A
RF Cable Assembly	B12551
Video Cable Assembly	B12553
Line Cord Adapter	A131966
Wrench Kit	A25109
Operating and Maintenance Instructions	--

TABLE 1-2. EQUIPMENT SPECIFICATIONS

Characteristic	Specification
Frequency range	1107A/1207A: 3.70 to 8.40 GHz 1108A/1208A: 6.95 to 11.00 GHz
Frequency accuracy	±0.5% (digital readout)
Frequency stability	0.0008% volt change in line, 0.005%/°C ambient
ΔF Control	Range of 1.5 MHz maximum
Maximum uncalibrated power output	1107A: >10 milliwatts (+10 dbm), >15 milliwatts above 5.0 GHz, >25 milliwatts below 4.3 GHz 1108A: >20 milliwatts (+13 dbm) minimum from 7.0 to 8.0 GHz, >10 milliwatts (+10 dbm) minimum from 8.0 to 11.0 GHz 1207A: 3.7 - 4.3 GHz >60 mw, typically >100 mw 4.3 - 5.0 GHz >25 mw, typically >35 mw 5.0 - 6.6 GHz >55 mw, typically >200 mw (above 5.5 GHz) 6.6 - 8.4 GHz >35 mw, typically >100 mw 1208A: 6.95 - 8.0 GHz >75 mw, typically >100 mw 8.0 - 9.5 GHz >30 mw, typically >75 mw 9.5 - 11.0 GHz >40 mw, typically >50 mw
Attenuator dial range	1107A/1108A: +3 dbm (0.310 volts) to -127 dbm (0.1 microvolts)
Output power absolute accuracy	1107A/1108A: ±2 db (+3 dbm to -127 dbm)
Relative attenuator accuracy	1107A: ±0.8 db from -7 dbm to -127 dbm) 1108A: ±1.2 db from -7 to -127 dbm
Output impedance	1107A/1108A: 50 ohms, nominal
Output VSWR	1107A/1108A: 2:1 maximum
Output Connector	Type N
Types of output available	CW, square wave, or sawtooth fm without external modulation
Internal square wave:	
Rate	800 to 1200 Hz typical
On-off ratio	100%
Synchronization	Internal

(Cont'd)

TABLE 1-2. EQUIPMENT SPECIFICATIONS (Cont'd)

Characteristic	Specification
Internal fm:	
Rate	800 to 1200 sweeps per second typical
Sweep width	Continuously adjustable over 5.0 MHz throughout most of band
Synchronization	Internal
External pulse modulation:	(Polarad Model 1020 recommended)
Pulse requirements	Positive polarity, 15 to 50 volts peak
Rate	Single pulse to 1 MHz
Width of output pulses	0.2 to 2,500 microseconds
Rise time of output pulses	1107A/1207A: 0.15 microseconds, maximum
	1108A/1208A: 0.10 microseconds, maximum
Decay time of output pulses	1107A/1207A: 0.15 microseconds, maximum
	1108A/1208A: 0.10 microseconds, maximum
External fm modulation:	
Type and rate	Any waveshape having frequency components between 100 Hz and 0.5 MHz
Deviation	0 to ±5.0 MHz
Power requirements	115 or 230 volts ±10%, 50-60 Hz, 150 watts (50 to 400 Hz range optional, F modification)
Dimensions	5-1/4 in. high by 16-3/4 in. wide by 18-1/4 in. deep (see figure 2-1)
Weight	41 pounds

TABLE 1-3. ELECTRON TUBE AND TRANSISTOR COMPLEMENT

Quantity	Type	Quantity	Type
4	0A2	1	EL34
1	5687	1	8068
3	12AX7	1*	A160011A
2	A713441	1**	A160034
		1***	A160035

* Used in Models 1107A and 1207A only.
** Used in Model 1108A only.
*** Used in Model 1208A only.

1-18. ACCESSORIES FOR POLARAD SIGNAL GENERATORS AND SOURCES

1-19. The Polarad Model 1020 Modulator is a solid state function generator which provides adjustable, well-defined, precise pulses, square wave, and sawtooth waveforms for pulse, FM, and square wave modulation. It is a valuable accessory for the 0.80-21 GHz Series 1100 Signal Generators and Series 1200 Signal Sources. It can also be used with many other instruments. The repetition rates of all output waveforms are adjustable from 10 to 10,000 Hz. Pulse widths are adjustable from 0.2 to 20 microseconds. The linear sawtooth output is adjustable in amplitude to vary FM deviation. The 1020 Modulator can be synchronized internally, or externally by positive pulses, negative pulses, or sine waves. Sharp 25 volt sync pulse outputs are also generated. Sync outputs are available undelayed and delayed, from two output terminals. The delay is adjustable from 0.3 to 2,000 microseconds. The compact Polarad Model 1020 Modulator is provided in a 1-3/4" high modular cabinet which permits convenient rack mounting or stacking with other modular units of this series of Polarad instruments. Four side mounting brackets are supplied for rigid attachment to any companion Polarad instruments. When the top cover is removed all parts are available for accessibility and ease of servicing. Dimensions: 1-3/4" H x 16-3/4" W x 16-3/8" D.

1-20. The solid state Model 3815-S Frequency Stabilizer is used to phase lock the output frequency of Polarad Microwave Signal Generators and Sources, as well as with other instruments. Short term stability is rated at 0.8 Hz per GHz per millisecond. Long term stability of 10 Hz per GHz per hour is achieved during continuous operation in typical laboratory environments. The crystal controlled reference oscillator is mounted within a proportional temperature compensating oven. Dimensions: 5-1/4" H x 19" W x 18" D.

1-21. The Model MK-1 Klystron Mode Alignment Modulator is used in conjunction with a high-gain oscilloscope, a crystal detector, and a reaction wavemeter to perform mode alignment of klystron oscillators. The modulating voltage obtained from the REFLECTOR binding posts of the Model MK-1 causes the klystron that is being aligned to sweep over a frequency excursion that is proportional to the modulating voltage applied to the reflector electrode. The rf output of the equipment under test is detected and applied to the vertical amplifier of a high-gain oscilloscope. The phasing voltage obtained from the H SCOPE binding posts of the Model MK-1 is applied to the horizontal amplifier of the high-gain oscilloscope. The oscilloscope waveforms obtained,when the Model MK-1 is used as a modulation source, are then utilized for frequency and mode alignment as outlined in technical maintenance manuals for Polarad Signal Generators and Sources.

The Model MK-1 may also be used as an external modulating FM input signal for the generators and sources. It operates similarly to the internal FM signal except that it provides sine wave modulation instead of the internal sawtooth. Its larger amplitude provides deviation over the full range of the klystron mode; thus generating greater FM deviation than is available internally. Dimensions: 5-3/4" H x 4" W x 4" D.

Additional technical and ordering information available upon request from:

Instrument Application Department

Polarad Electronic Instruments

5 Delaware Drive

Lake Success, New York 11040

SECTION II

OPERATION

2-1. GENERAL.

2-2. Models 1107A, 1108A, 1207A, and 1208A are shipped complete and ready to operate; no special or permanent installation procedures are required. The instrument should be unpacked upon receipt, observing the usual precautions customary when unpacking an electronic instrument.

2-3. INSTALLATION.

2-4. After unpacking the instrument, plan its installation. If it will be used on a bench or cart, the required space is shown in figure 2-1. If it will be mounted in a rack, the handles at either end of the panel should be reversed as shown in figure 2-1 for rack mounting. The instrument requires 115 or 230 volts, single phase, 50-60 Hz ac power.

Note

Models 1107A, 1108A, 1207A, and 1208A are shipped ready for 115-volt operation. If the instrument will be operated from a 230-volt source, remove its top cover and set the 115/230 volt switch to the 230 volt position. The location of the switch is shown in figure 2-1.

2-5. Connect the power cable of the instrument to an ac receptacle. If the ac receptacle is not a grounding type, use adapter A131966, furnished with the instrument.

2-6. OPERATING PROCEDURES.

2-7. The operating procedures for Models 1107A, 1108A, 1207A, and 1208A are described in paragraphs 2-8 through 2-13.

2-8. OPERATING CONTROLS, INDICATORS, AND CONNECTORS. The operating controls, indicators, and connectors of the instrument are located on its front panel, as shown in figure 2-2, and their functions are listed in table 2-1.

2-9. CONNECTION AND PRELIMINARY OPERATION. To operate Models 1107A, 1108A, 1207A, and 1208A, proceed as follows:

a. Connect instrument to device under test and external modulation source, if required, as shown in figure 2-3.

b. Set POWER switch to ON and allow the instrument to warm up for 15 minutes.

c. Tune the frequency control for a readout of the desired frequency on the FREQUENCY GHz dial.

d. On Models 1107A and 1108A only, set the MODULATION SELECTOR switch to CW position and adjust the POWER SET control for a power monitor meter indication of CAL.

Note

The power monitor meter is graduated from -3 to +3, with the CAL marking midway between the extremes. If the POWER SET control is adjusted to obtain an indication other than CAL, the indication of the power monitor meter should be algebraically added to the reading of the attenuator dial. For example, if the power monitor meter reads -2 and the attenuator dial is set at -56 dbm, the power level at the RF OUTPUT connector would be -58 dbm.

e. On Models 1107A and 1108A only, adjust the ATTENUATOR control for the desired power output level at the RF OUTPUT connector. If required, correct the reading of the attenuator dial for power monitor meter readings other than CAL, as described in the preceding note.

Note

Use of the 6 db range of the power monitor meter provides an additional 3 db at each end of the power output range, giving an overall range from +6 dbm to -130 dbm.

f. On Models 1207A and 1208A, adjust the ATTENUATOR control for the desired power output level at the RF OUTPUT connector. There is no attenuator dial on these models.

g. To operate Models 1107A and 1108A at another frequency, perform steps c, d, and e.

h. To operate Models 1207A and 1208A at another frequency, perform steps c and f.

Note

The ΔF control provides a frequency vernier with a range of 1.5 MHz.

i. To interrupt the rf power output, set the MODULATION SELECTOR switch at RF OFF.

2-10. OPERATION WITH INTERNAL MODULATION. Models 1107A, 1108A, 1207A, and 1208A have three internal modulation modes: cw (no modulation), square wave, and internal fm. To operate in these modes, proceed as follows:

a. For cw operation, turn the MODULATION SE-

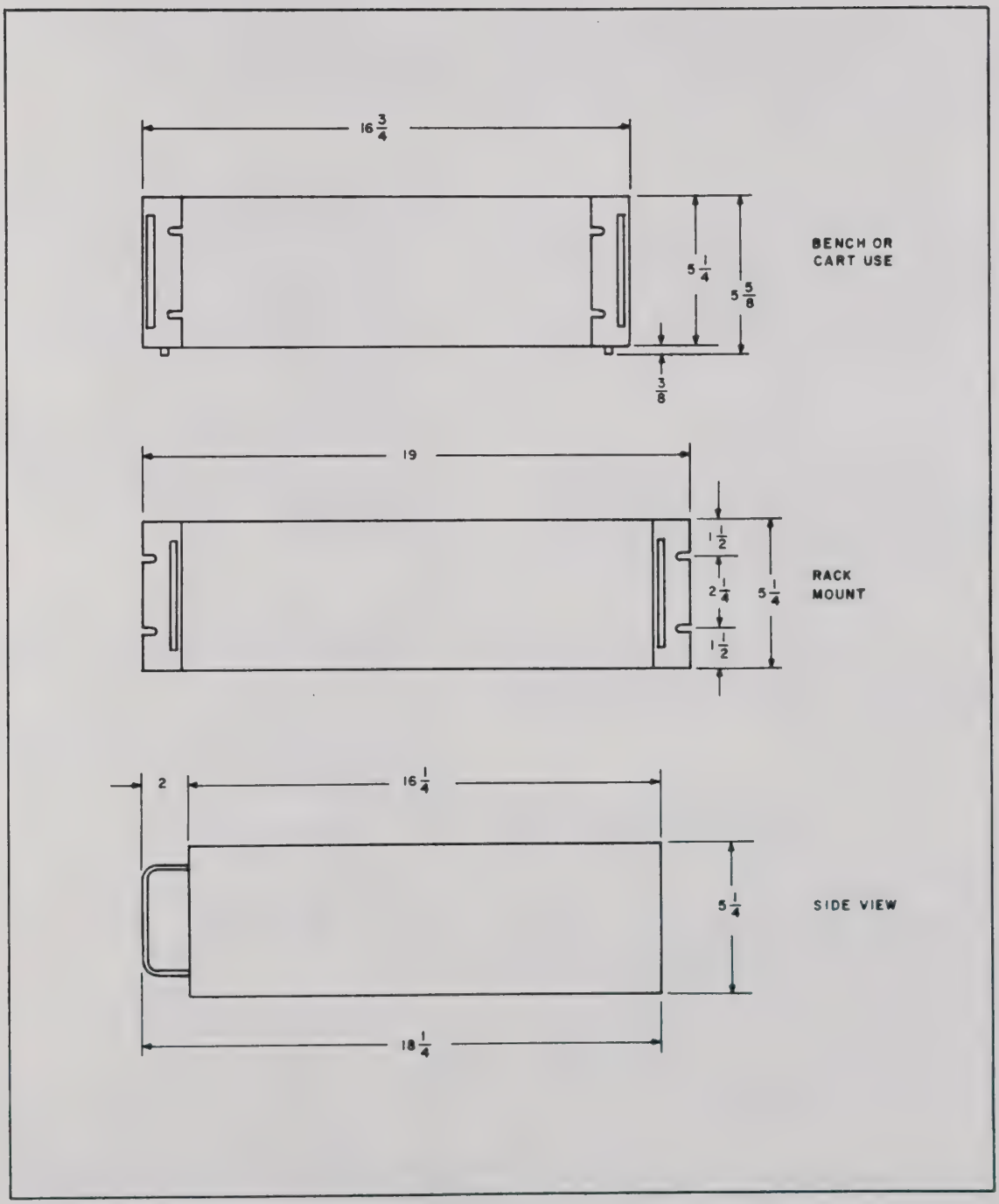
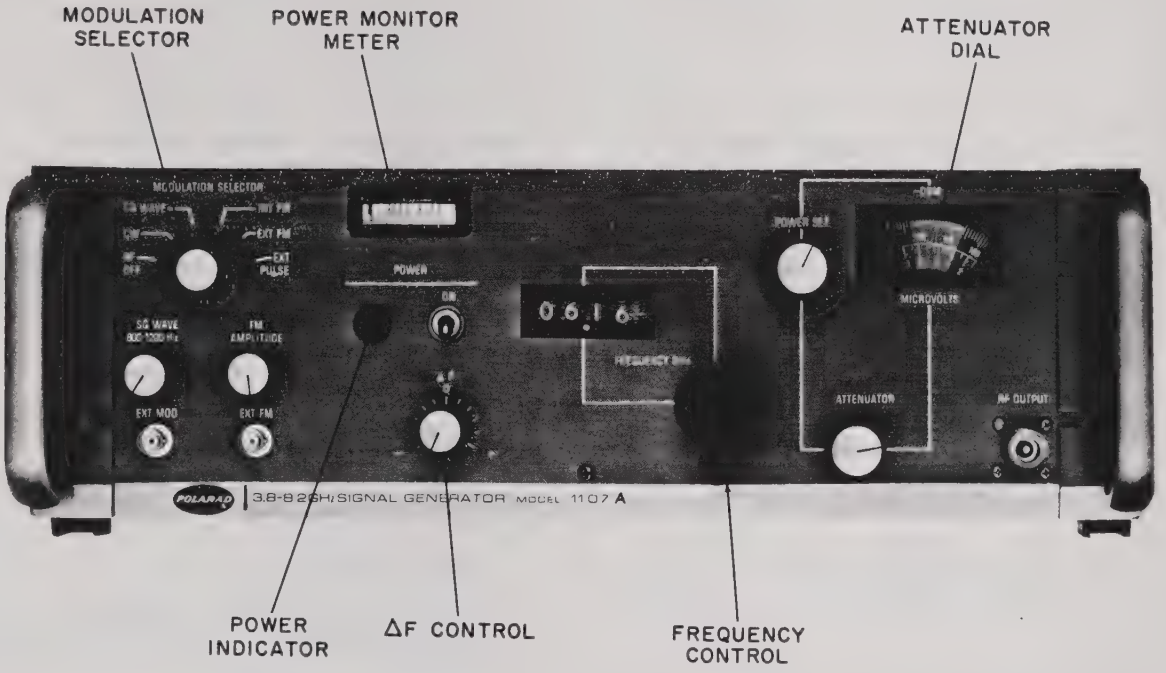
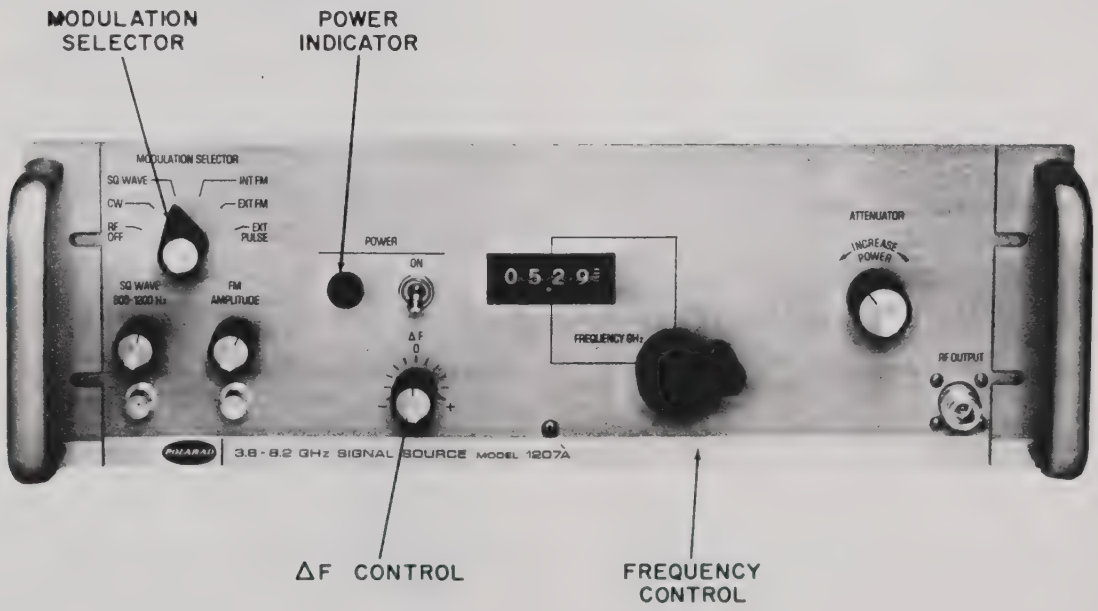


Figure 2-1. Models 1107A, 1108A, 1207A, and 1208A, Outline Installation Drawing



MODELS 1107A AND 1108A



MODELS 1207A AND 1208A

Figure 2-2. Operating Controls, Indicators, and Connectors

TABLE 2-1. OPERATING CONTROLS, INDICATORS, AND CONNECTORS

Control, Indicator, or Connector	Function
POWER switch	Controls application of ac power
Power indicator lamp	Lights when power is applied to instrument
MODULATION SELECTOR switch	Selects type of modulation, as follows:
	RF OFF: Disables rf output
	CW: No modulation present
	SQ. WAVE: Internal square wave modulation
	INT FM: Internal fm modulation
	EXT FM: External fm modulation
	EXT PULSE: External pulse modulation
SQ. WAVE 800-1200 Hz control	Adjusts square wave frequency over the range of 800-1200 Hz
FM AMPLITUDE control	Adjusts amplitude of fm
EXT MOD connector	Accepts external pulse or square wave modulation signal
EXT FM connector	Accepts external fm signal
FREQUENCY GHz dial	Displays digital readout of instrument frequency
Frequency control	Adjusts instrument frequency
ATTENUATOR control	Adjusts output power level of instrument
RF OUTPUT connector	RF output of instrument
RF MONITOR connector (rear of instrument)	Used for automatic frequency stabilization
STABILIZER INPUT terminals (rear of instrument)	Used for automatic frequency stabilization
Fuse (rear of instrument)	Protects instrument from overload
△F Control	Fine frequency control
Note	
The items listed below apply only to Models 1107A and 1108A	
POWER SET control	Used to adjust oscillator power level for power monitor meter indication of CAL
Attenuator dial	Displays reading in -dbm and microvolts of attenuator output at RF OUTPUT connector when power meter is set at CAL
Power monitor meter	Used to set power level of instrument for attenuator calibration

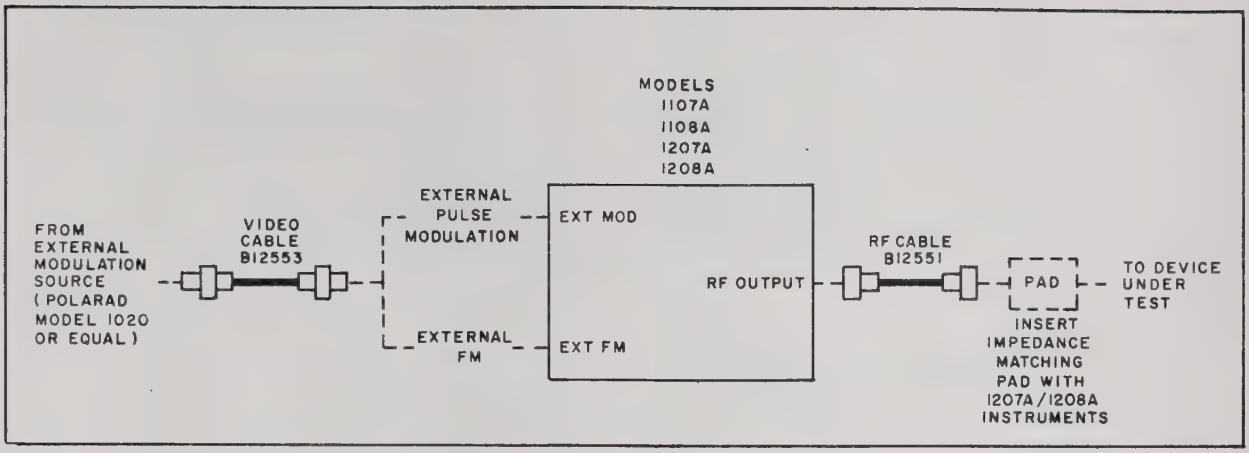


Figure 2-3. Models 1107A, 1108A, 1207A, and 1208A, Connections for Use

LECTOR switch to CW. In this mode the SQ. WAVE 800-1200 GHz control and the FM AMPLITUDE control have no effect.

b. For square wave operation, turn the MODULATION SELECTOR switch to SQ. WAVE and adjust the SQ. WAVE 800-1200 Hz control for the desired square wave frequency.

c. For internal fm operation, turn the MODULATION SELECTOR switch to INT FM. In this mode the sweep rate is determined by the adjustment of the SQ. WAVE 800-1200 Hz control, and the sweep width is determined by the adjustment of the FM AMPLITUDE control. To obtain maximum FM deviation, it may be necessary to vary the ΔF control.

2-11. OPERATION WITH EXTERNAL MODULATION. Models 1107A, 1108A, 1207A, and 1208A have provision for two external modulation modes: fm and pulse. In these modes the SQ. WAVE 800-1200 Hz control and the FM AMPLITUDE control have no effect, since these functions are performed by the external modulation sources. To operate in these modes, proceed as follows:

Note

Polarad Model 1020 Modulator is recommended for external pulse, FM, and square wave modulation.

a. For external fm operation, connect the modulation source to the EXT FM connector and turn the MODULATION SELECTOR switch to EXT FM. The modulation can be any waveshape having frequency components between 100 Hz and 0.5 MHz, and the deviation can be from 0 to ± 5.0 MHz.

b. For external pulse modulation, connect the modulation source to the EXT MOD connector and turn the MODULATION SELECTOR switch to EXT PULSE. The pulse modulation must have positive polarity, at 15 to 50 volts peak, with pulse width from 0.2 to 2500 microseconds.

Note

At some frequency settings, it is advisable for most stable pulse modulation to adjust the ΔF control. A detector and an external oscilloscope can be used to display the detected output pulse.

2-12. AUTOMATIC FREQUENCY STABILIZATION. Models 1107A, 1108A, 1207A, and 1208A include provisions for automatic frequency stabilization to better than 10 Hz, with the degree of stabilization being dependent on the gain and stability of the external control system used. The input of the phase- or frequency-control system used is connected to the RF MONITOR connector at the rear of the instrument and the output of the control system is connected to the STABILIZER INPUT terminals, also at the rear of the instrument.

2-13. OPERATION WITH OTHER MODULAR MICROWAVE INSTRUMENTS. In addition to the individual use of the Signal Generators and Sources, they can be grouped with other instruments in the Modular Microwave series to extend their capabilities. Table 2-2 lists some of the possible combinations and their capabilities. Models 1020, 1207A, and 1509 can be stacked to form Model 1809A with frequency ranges of 3.7 to 8.4 GHz and 10.0 to 15.5 GHz and full modulation capability.

2-14. PACKAGING INSTRUCTIONS.

2-15. PACKAGING FOR SHORT TERM STORAGE. If the instrument is to be stored for a relatively short period, cover it with a suitable protective covering, such as a sheet of plastic or paper. Put the accessories and instruction manual in an envelope or bag and fasten it to the instrument to prevent loss. Store the instrument in a clean and dry area where it will not be subjected to extreme temperatures.

2-16. PACKAGING FOR LONG TERM STORAGE OR SHIPMENT. (See figure 2-4.) If the instrument is to be stored for a long time or shipped, proceed as follows:

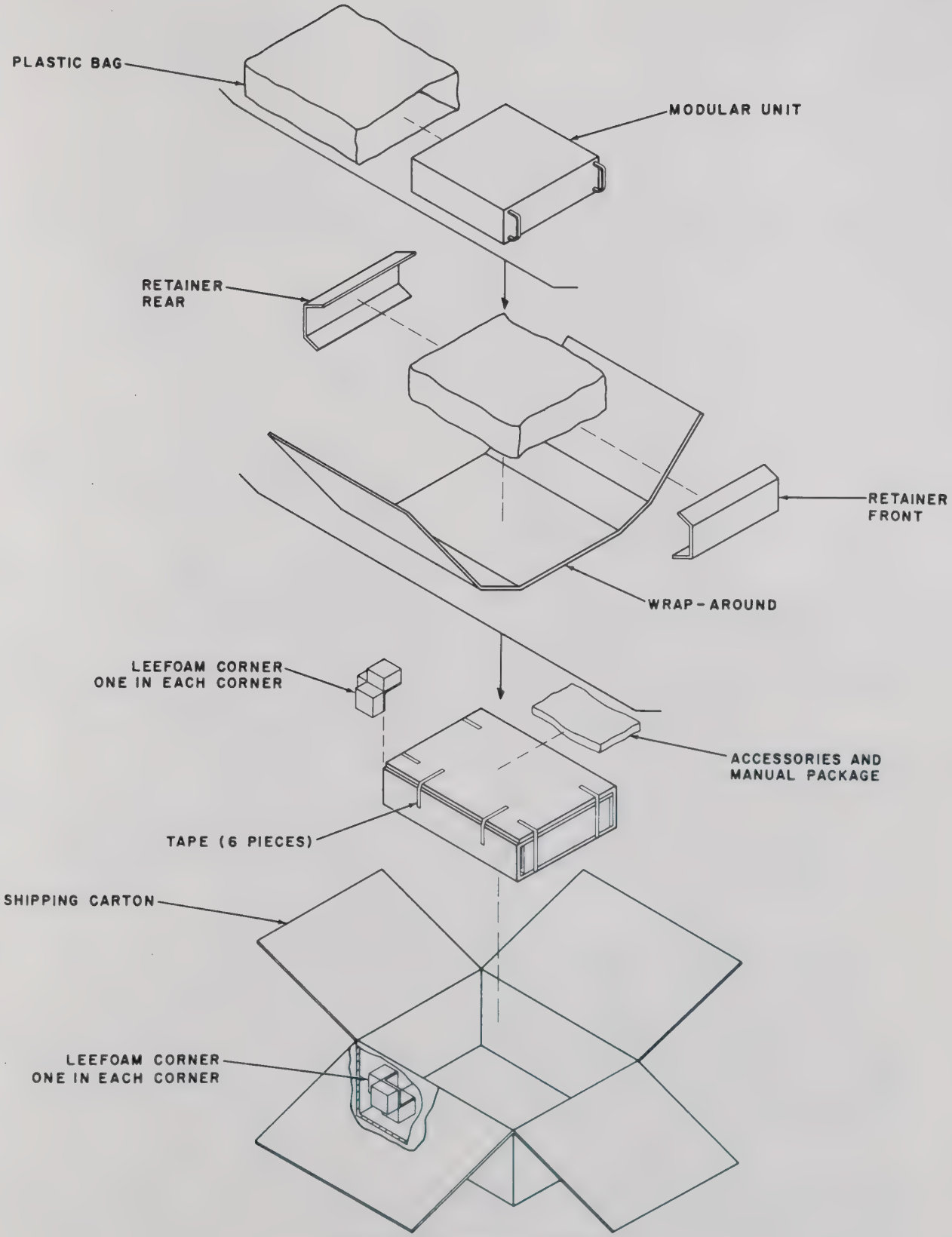


Figure 2-4. Packaging Diagram

a. If the original wrappings and carton have been saved, re-package the instrument in them.

b. If new packing materials are to be used, assemble the necessary wrappings and carton.

c. Wrap the instrument in a moisture- and vapor-proof barrier such as plastic or waterproof paper.

d. Wrap the accessories and instruction manual in a moisture- and vapor-proof barrier.

e. Place the packages in a suitable carton. Fill all voids in the carton with suitable packing to prevent the packages from shifting in the carton.

f. Seal and mark the carton.

g. If the storage or shipping conditions make it necessary, enclose the carton within an outer carton or wooden box.

TABLE 2-2. MODULAR MICROWAVE INSTRUMENT COMBINATIONS

Signal Source	Signal Generator	Frequency Doubler	Modulator	Capabilities
----	1107A	----	1020	1107A range with full modulation capabilities (Model 1607A)
----	1108A	----	1020	1108A range with full modulation capabilities (Model 1608A)
1207A	----	1509	----	10.0-15.5 GHz range (Model 1709A)
1207A	----	1509	1020	10.0-15.5 GHz range with full modulation capabilities (Model 1809A)
1208A	----	1510	----	15.0-21.0 GHz range (Model 1710A)
1208A	----	1510	1020	15.0-21.0 GHz range with full modulation capabilities (Model 1810A)

SECTION III

THEORY OF OPERATION

3-1. GENERAL.

3-2. The Modular Microwave Signal Generators and Sources, Models 1107A, 1108A, 1207A, and 1208A, are signal-generating devices that employ klystron oscillators with external cavities to generate rf energy. The signal generator models, 1107A and 1108A, have calibrated attenuators and 50-ohm output impedance; the signal source models, 1207A and 1208A, have uncalibrated attenuators and a low reactive output impedance. The signal generators and sources have identical principles of operation, differing only in attenuator calibration and power monitoring, output impedance, and output power level. The 1107A and 1108A have a maximum calibrated power output of +3 dbm (0.310 volts), and the 1207A and 1208A have a minimum available power output of 25 milliwatts. The frequency ranges of the generators and sources are listed below.

Models	Range, GHz
1107A, 1207A	3.7 to 8.4
1108A, 1208A	6.95 to 11.0

3-3. The ensuing theory of operation coverage will be for all four models (1107A, 1108A, 1207A, 1208A), except where specific model reference is made.

3-4. BLOCK DIAGRAM ANALYSIS.

3-5. The signal generators and sources, shown in block diagram form in figure 3-1, consists of seven principal circuit elements, a klystron oscillator, its repeller tracking system, a beam power supply, a repeller and keyer power supply, a Schmitt trigger keyer, a square wave generator, and an integrator circuit. The klystron oscillator employs a reflex klystron tube in an external coaxial cavity, which is tuned to resonance by a non-contacting tuning plunger driven by the tuning control. The frequency drive system also operates the digital readout frequency dial and the tracking system, which selects the proper repeller mode and adjusts the repeller voltage for the frequency selected. The power supplies are conventional regulated supplies using pass tubes, voltage regulators and dc amplifiers. The Schmitt trigger keyer delivers the square wave and pulses to the klystron oscillator, clamping the output level during the application of a pulse to that of the preset cw level. The square wave generator is an astable multivibrator with a variable rate from 800 to 1200 Hz. For square wave amplitude modulation, the output of the square wave generator is fed through the keyer to the control grid of the klystron. For sawtooth frequency modulation, the output of the square wave generator is fed to the integrator, which converts the square wave to a sawtooth. The sawtooth is fed to the klystron repeller.

3-6. Models 1107A and 1108A incorporate a power monitoring circuit that enables the attenuator to be calibrated directly in -dbm and microvolts. The power set drive system moves the power monitor probe and the hairline of the attenuator dial. The power monitor probe couples rf power from the klystron cavity to the crystal detector and power monitor meter. When the power set control is adjusted for a power monitor meter indication of CAL, the power monitor probe is coupled to a 1 milliwatt power level. The attenuator control operates the attenuator probe and the dbm-microvolts dial to provide a calibrated rf output.

3-7. Models 1207A and 1208A incorporate an uncalibrated output attenuator. The attenuator control operates the attenuator probe, which couples rf power from the klystron cavity to the rf output connector.

3-8. The signal generators and sources incorporate a provision for automatic frequency stabilization. A sample of power in the klystron oscillator is fed to an external control system and the output of the external control system is fed to the klystron repeller as a correction voltage which is superimposed on the repeller voltage.

3-9. DETAILED THEORY OF OPERATION. (See figures 3-1 and 5-1 through 5-4.)

3-10. KLYSTRON OSCILLATOR. Klystron oscillator V11 produces the rf power output. It is a velocity-modulated tube operating in an external resonant coaxial cavity. The cavity is in the form of a coaxial transmission line and consists of two cylinders, one inside the other. The klystron tube is mounted in one end of the cavity, with the outer cylinder making contact with the first resonator grid and the inner cylinder making contact with the second resonator grid. The resonant circuit is completed at the other end of the cavity by a movable non-contacting tuning plunger. The position of this plunger determines the resonant frequency of the cavity.

3-11. The oscillator cavity output is coupled through two probes; the attenuator probe with a variable amount of insertion that determines the rf power level delivered to the rf output connector, and the fixed rf monitor probe that supplies the power sample for automatic frequency stabilization.

3-12. Models 1107A and 1108A incorporate a power monitor probe with a variable amount of insertion that supplies power to the monitoring circuit for calibrating the output attenuator.

3-13. MODE SWITCHING. The frequency of oscillation of the klystron oscillator is determined by the

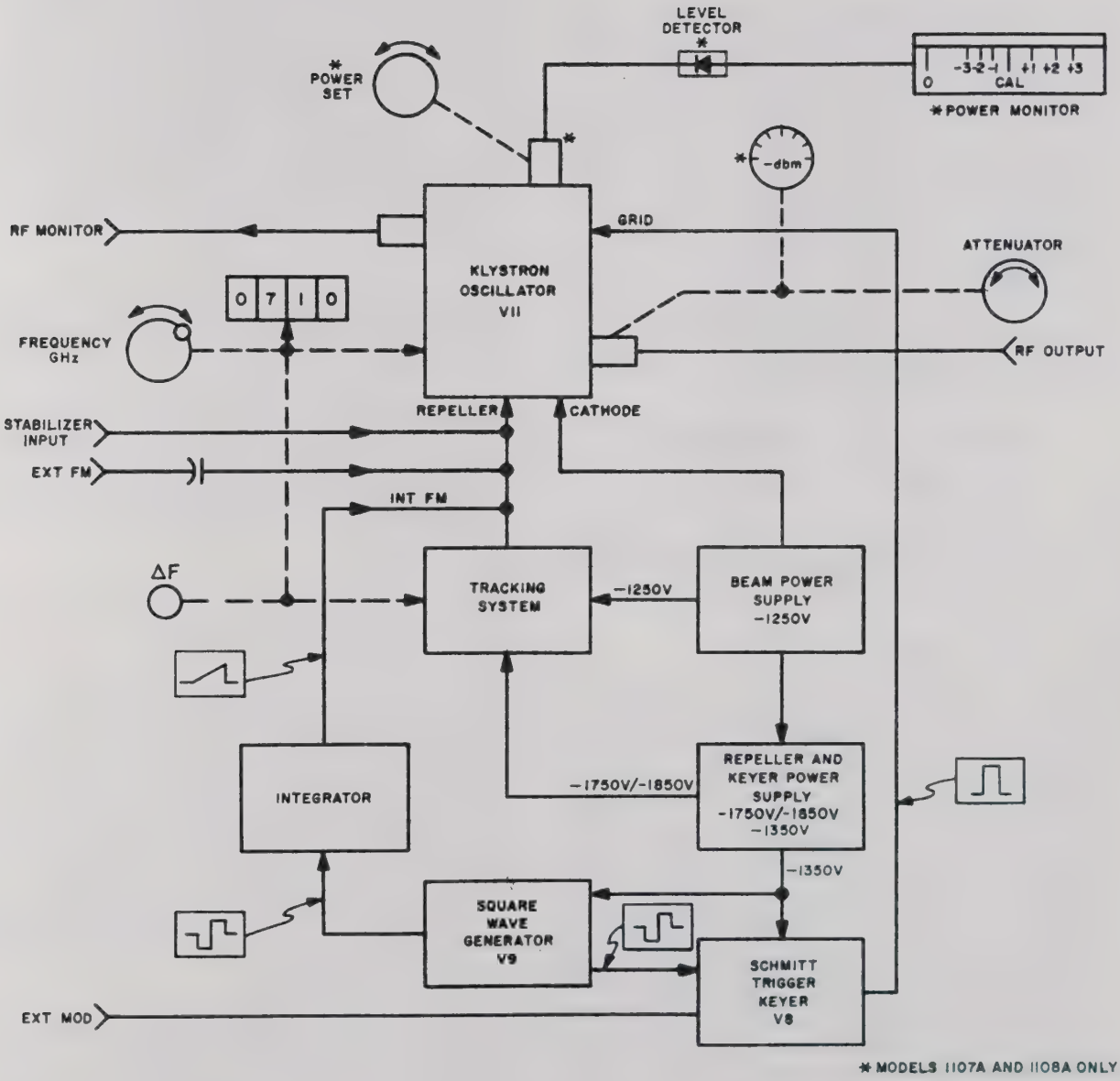


Figure 3-1. Modular Microwave Signal Generators and Sources, Models 1107A, 1108A, 1207A, and 1208A, Block Diagram

resonant frequency of the cavity and the magnitude of the repeller voltage. For a given setting of the cavity, there is an optimum repeller voltage that will cause the bunched electrons to return to the resonator grids at the proper time. The repeller voltage, therefore, cannot remain the same over the frequency range of the oscillator. In order to produce oscillation over the frequency range of the oscillator, a tracking arrangement is used to vary the dc voltage on the repeller so that it is maintained at the optimum value for the maximum amplitude of oscillation. At a certain frequency value (4.40 and 6.66 GHz for Models 1107A and 1207A; 8.0 GHz for Models 1108A and 1208A, approximately) the repeller voltage becomes excessively high and it is more practical to change the repeller voltage to a new range. This can be done without changing the frequency of oscillation at a given cavity setting by lowering the repeller voltage so that the tube operates in a higher mode. In the higher mode the bunched electrons require a longer time in cycles to be returned to the resonator grids. Models 1107A and 1207A operate in the 1-3/4, 2-3/4 and 3-3/4 modes, Models 1108A and 1208A operate in the 2-3/4 and 4-3/4 modes. The switching arrangement is described in paragraph 3-14.

3-14. REPELLER VOLTAGE TRACKING SYSTEM. The dc voltage applied to the repeller is controlled by tracking potentiometer R81. The movement of the arm of R81 is mechanically ganged with the movement of the tuning plunger in the klystron cavity so that the repeller voltage is maintained at the optimum value for the maximum amplitude of oscillation. Repeller mode switch S4 is operated by a cam on the main tuning drive and changes the voltage applied to R81 so that a different mode can be used. The values of the resistors in the tracking circuit are calculated for the proper frequency-vs-voltage characteristic. Adjustment potentiometers are provided in the tracking circuit to compensate for variations in klystron repeller voltage characteristics. The maximum voltage across tracking potentiometer R81 is 525 volts since it is connected from the -1225 volt beam supply to the -1750/-1850 volt repeller supply. The cathode of klystron V11 is connected to the -1250 volt beam supply and therefore the repeller voltage can vary from 0 to -500/-600 volts.

Note

The ΔF control R125 provides a small variation in the repeller voltage, which produces a vernier frequency variation of at least 1.5 MHz.

3-15. PROTECTIVE DIODE. Protective diode CR81 (see figures 5-1 through 5-4) is connected between the cathode and repeller of klystron V11 to prevent the repeller from becoming more positive than the cathod, which would damage the klystron.

3-16. FREQUENCY CONTROL KNOB. The frequency control knob rotates a shaft that extends through the tuning mechanism casting to the rear of the instrument, where it protrudes for attachment to an external motor drive. The shaft drives the digital readout, the cam that positions the tuning plunger, and the tracking potentiometer, each through appropriate gearing. The mode switch described in paragraph 3-13 is mounted on the tracking potentiometer assembly.

3-17. OUTPUT ATTENUATOR KNOB. The ATTENUATOR knob drives a shaft that extends through the tuning mechanism casting to the location of the attenuator probe. In Models 1107A and 1108A the attenuator dial is driven by a small pinion on the ATTENUATOR shaft, and the dial drives the attenuator probe through a rack and pinion that converts rotary to linear motion.

3-18. POWER SET KNOB (MODELS 1107A AND 1108A ONLY). The POWER SET knob drives a shaft that extends through the tuning mechanism casting to the location of the power monitor probe. The knob shaft mounts a small pinion that drives a large gear to which the attenuator dial hairline is attached, and which drives the pinion and rack that positions the power monitor probe.

3-19. POWER MONITOR OPERATION (MODELS 1107A AND 1108A ONLY). When the POWER SET knob in Models 1107A and 1108A is rotated to obtain a power monitor meter indication of CAL, the hairline of the attenuator dial is shifted to a position consistent with the rf power level in the klystron cavity. This movement of the hairline compensates for differences in cavity rf power level and provides a direct-reading attenuator dial.

3-20. SCHMITT TRIGGER KEYER. The Schmitt trigger keyer V8 has two conditions of operation. When its input grid is biased from the junction of resistors R62 and R63, its input section is not conducting and its output section is conducting. In the other condition, with its input grid biased from the junction of resistors R61 and R62, its input section is conducting and its output section is not conducting. These two conditions of operation are changed by the application of pulse or square wave modulation superimposed on the input grid bias, which switches the Schmitt trigger keyer from one condition to the other very rapidly. The rapidity of this keying action is principally due to the cathode feedback caused by the common cathode resistor R68.

3-21. TRANSISTORIZED DELAY CIRCUIT. The transistorized delay circuit is essentially a Schmitt trigger multivibrator which operates Delay Relay K1. This relay controls the grid bias of the pass tube V1. When the relay is actuated, it switches V1 from a cut-off state into the feed-back loop, allowing the power supply voltage to be built up. When power is initially turned on, capacitor C7 has no charge, causing transistor Q1 to be cut off. All the current then passes through Q2. When C7 develops a voltage greater than the emitter voltage of Q1, the latter starts to conduct and the multivibrator switches its state. Transistor Q1 now conducts, thereby actuating the delay relay. At this moment, Q2 is cut off. This condition remains stable until the unit is de-energized.

3-22. SQUARE WAVE GENERATOR. The square wave generator V9 is an astable multivibrator that has a free-running frequency determined gy the setting of the SQ. WAVE control R72. The symmetry of its square wave output is adjusted by the SYMMETRY control R73, which balances out any inequalities in the circuit. Diode CR62 prevents the grid of V9B from overshooting during the switchover from one state to the other.

3-23. MODULATION SELECTION. The six-position MODULATION SELECTOR switch S2 selects three modes of internally-keyed operation, two modes of externally-keyed operation, and shuts the klystron oscillator off in the remaining position. The circuit operation in each position of the MODULATION SELECTOR switch is described below.

3-24. RF OFF Position. In the RF OFF position the Schmitt trigger keyer V8 is biased so that its output section is conducting. This places the grid of klystron oscillator V11 at a negative potential sufficient to drive the tube into cutoof, thus inhibiting oscillation.

3-25. CW Position. In the CW position the Schmitt trigger keyer V8 is biased so that its output section is not conducting. This places the grid of klystron oscillator V11 at a potential that permits it to oscillate.

3-26. SQ. WAVE Position. In the SQ. WAVE position the Schmitt trigger keyer V8 is biased so that its output section is conducting, which inhibits klystron oscillation. The keyer, however, is driven by square wave generator V9 and therefore reverses condition and permits klystron oscillation at a rate determined by the setting of SQ. WAVE control R72. In this mode of operation the square wave output of keyer V8 grid-modulates klystron oscillator V11, producing a square-wave modulated rf output.

3-27. INT FM Position. In the INT FM position the Schmitt trigger keyer V8 is biased so that its output section is not conducting, which permits klystron oscillation. The voltage on the repeller electrode of klystron oscillator V11 is modulated by a sawtooth voltage obtained from the square wave generator V9 to obtain a frequency-modulated rf output. The square wave output of V9 is applied to an integrating circuit consisting of diode CR61, resistors R77 and R76, and capacitor C65, which produces a sawtooth output that is applied to the repeller of V11 through resistor R79. The width of the FM sweep is varied by FM AMPL control R76, and the repetition rate is varied by SQ. WAVE control R72.

3-28. EXT FM Position. In the EXT FM position, as in the INT FM position, the Schmitt trigger keyer V8 is biased so that its output section is not conducting, which permits klystron oscillation. The voltage on the repeller electrode of klystron oscillator V11 is modulated by an external sawtooth voltage applied at the EXT FM connector J3. The square wave generator V9 is not energized in this position.

3-29. EXT PULSE Position. In the EXT PULSE position the Schmitt trigger keyer V8 is biased so that its output section is conducting, which inhibits klystron oscillation. The keyer, however, is driven by pulses from an external source applied at the EXT MOD connector J2.

3-30. BEAM POWER SUPPLY. The beam power supply is a series regulated power supply delivering -1250 volts. It consists of a bridge rectifier CR1 through CR4, a series regulator V1, a voltage reference V2, and a control amplifier V3. The screen of the series regulator V1 is supplied with regulated +150 volts by a power supply consiting of diode CR13 and voltage regulator V10. Delay relay K1 biases the series regulator V1 beyond cutoff during its delay period of approximately 60 seconds, delaying the application of the beam voltage until the klystron has warmed up. After the delay period has elapsed, K1 operates and switches the grid of V1 to the plate of the control amplifier V3, which activates the -1250 volt beam power supply.

3-31. REPELLER POWER SUPPLY. The repeller power supply is a pass tube regulated power supply delivering -533/-633 volts, of which 500/600 volts is in series with the -1250 volt repeller power supply. The remaining 33 volts appears across diode CR14. A floating 150 volt power supply is divided down from the repeller power supply. The repeller power supply consists of bridge rectifier CR31 through CR38, series regulator V4, voltage reference V5, and control amplifier V6. The floating 150-volt power supply is maintained at that value by voltage regulator V7.

3-32. KLYSTRON FILAMENT SUPPLY. The klystron filament is supplied with regulated dc voltage to minimize drift and incidental amplitude- and frequency-modulation. The klystron filament supply consists of ciode CR91 and zener diode CR92. It is referenced to the -1250 beam power supply.

3-33. AC FILAMENT SUPPLY. The remaining tube filaments are supplied with 6.3 volts ac from secondaries of power transformer T1. Series regulator V1 and control amplifier V3 are operated with their filaments referenced to ground potential, and the remaining tubes, V4, V6, V8, and V9 are referenced to -1250 volts.

3-34. POWER SUPPLY ADJUSTMENTS. The power supplies are provided with three adjustments, which are described below.

3-35. -1250 ADJ Control. The -1250 ADJ control R17 sets the operating point for control amplifier V3, which maintains the beam power supply at its set value.

3-36. -1750/-1850 ADJ Control. The -1750/-1850 ADJ control R37 sets the operating point for control amplifier V6, which maintains the repeller power supply at its set value.

3-37. BEAM CUR ADJ Control. The BEAM CUR ADJ control R44, which has a range of approximately 33 volts, adjusts the beam current through the klystron. The beam current is measured at TP1.

Note

The floating 150-volt keyer power supply is maintained at that value by voltage regulator V7 regardless of the setting of the BEAM CUR ADJ control.

SECTION IV

MAINTENANCE

4-1. GENERAL.

4-2. This section contains maintenance and alignment procedures for the Modular Microwave Signal Generators and Sources, Models 1107A, 1108A, 1207A, and 1208A. Included in this section are a list of test equipment required, minimum performance standards for the instruments, a troubleshooting procedure, and the alignment procedures required for the instruments.

4-3. TEST EQUIPMENT REQUIRED.

4-4. Table 4-1 lists the test equipment required for the maintenance of Models 1107A, 1108A, 1207A, and 1208A. Test equipment of equivalent characteristics may be substituted for the items listed.

TABLE 4-1. TEST EQUIPMENT REQUIRED

Name	Manufacturer and Model No.	Use
ADAPTER, BNC (2 required)	Pomona Model 1269	Klystron mode alignment tests
ADAPTER, Coaxial	UG-57B/U	Power and attenuation tests
ADAPTER, Coaxial (2 required)	UG-273/U	Frequency, square wave, and pulse tests
BOLOMETER*	Narda Model N603	Attenuation tests
COAXIAL DETECTOR	Narda Model 561NF	Power output tests
CRYSTAL DETECTOR	Narda Model 501	Square wave and pulse tests
CRYSTAL DIODE	1N21	Frequency, square wave, and pulse tests
DIFFERENTIAL VOLTMETER	Fluke Model 801	Voltage tests
FREQUENCY METER	PRD Model CX518	Frequency tests
KLYSTRON MODE ALIGNMENT MODULATOR	Polarad Model MK-1	Klystron mode alignment**
MICROWAVE POWER METER	Narda Model 440	Power output tests
MODULATOR	Polarad Model 1020	External modulation tests
MULTIMETER	Triplett Model 630	Current and resistance tests
OSCILLOSCOPE	Tektronix Model 545A	Frequency, square wave, and pulse tests
PAD, 3 db	Applied Research Model HFA50-3DB	Frequency, square wave, and pulse tests
PAD, 20 db	Narda Model 757-20	Power output tests
PREAMPLIFIER, Oscilloscope	Tektronix Type K	Used with oscilloscope
THERMISTOR	Narda Model N335	Power output tests
VOLTBOX	Fluke Model 805B	Voltage tests
VSWR AMPLIFIER*	Narda Model 441B	Attenuation tests

* Required for Models 1107A and 1108A only.

** Available from Polarad - $115.00, FOB, Lake Success, New York.

4-5. PRELIMINARY INSPECTION.

4-6. Perform a preliminary visual and manual inspection of the instrument before undertaking any maintenance procedure. Remove the top and bottom dust covers of the instrument to inspect its interior. Look for loose or damaged parts, dust, dirt, oil or grease, and corrosion. Correct such conditions before proceeding with maintenance.

WARNING

THE STABILIZER INPUT TERMINAL BOARD ON THE REAR OF THE CHASSIS HAS A REGULATED POTENTIAL OF 1750/1850 VOLTS DC ON ITS TERMINALS. A SEVERE SHOCK OR DEATH MAY RESULT FROM AN ACCIDENTAL CONTACT WITH THESE TERMINALS.

CAUTION

DO NOT DISTURB ANY ADJUSTMENTS ON COMPONENTS OF THE KLYSTRON OSCILLATOR CASTING. A COMPLETE REALIGNMENT MAY BE REQUIRED IF ANY ADJUSTMENTS ARE TOUCHED.

4-7. MINIMUM PERFORMANCE STANDARDS.

4-8. The minimum performance standards listed in table 4-2 will determine whether the instrument is operating within the specification limits listed in table 1-2.

4-9. TROUBLESHOOTING.

4-10. The troubleshooting procedure for the instrument is given in table 4-3. If the location of the trouble is indefinite or cannot be localized, start the troubleshooting procedure at the step that most closely resembles the trouble encountered.

WARNING

A REGULATED DC VOLTAGE OF 1750/1850 VOLTS WILL BE ENCOUNTERED DURING THE TROUBLESHOOTING TESTS. DO NOT CONNECT OR DISCONNECT TEST EQUIPMENT WHICH CONNECTS INTERNALLY WITH THE INSTRUMENT ENERGIZED.

4-11. DISASSEMBLY AND REASSEMBLY INSTRUCTIONS.

4-12. Disassembly and reassembly instructions for the instrument are given in paragraphs 4-13 through 4-17. Component locations are shown in figures 4-2 through 4-5.

Note

Do not disassemble the instrument beyond the point at which the necessary repair or replacement can be made. Perform the applicable minimum performance checks of table 4-2 after any replacement procedure given below.

4-13. REMOVAL OF POWER SET PROBE ASSEMBLY (MODELS 1107A, 1108A ONLY). To remove the power set probe assembly (see figures 4-2, 4-3, and 4-5) proceed as follows:

a. Rotate the POWER SET control fully clockwise. Also rotate ATTENUATOR control fully clockwise.

b. Unfasten and remove the cable clamp that secures the power set probe cable W3.

c. Disconnect connector P6 from the level detector Z1.

d. Loosen the setscrew that secures the power set probe in the probe block.

e. Carefully slide the probe out of the power set barrel on the klystron cavity.

f. Remove the power set probe assembly from the instrument.

4-14. REPLACEMENT OF POWER SET PROBE ASSEMBLY (MODELS 1107A, 1108A ONLY). To replace the power set probe assembly, proceed as follows:

a. Rotate the POWER SET control and ATTENUATOR control fully clockwise.

b. Slip the probe end of the power set probe assembly through the space between the attenuator probe and the side frame, then insert the probe end through the probe lock into the power set barrel on the klystron cavity.

CAUTION

ADVANCING THE POWER SET PROBE TOO DEEPLY (MODEL 1108A ONLY) INTO THE KLYSTRON CAVITY WILL DAMAGE THE CAVITY.

Note

The grounded side of the probe tip must face away from the klystron tube.

TABLE 4-2. MINIMUM PERFORMANCE STANDARDS

Step	Purpose	Procedure	Normal Indication	Abnormal Indication Reference
1	Evaluate power operating conditions	Connect instrument under test to power source and set POWER switch at ON.	POWER indicator lights when power is applied. Delay relay K1 operates after approximately 60 seconds.	Check DS1, F1, S1, power cable, and setting of 115/230 volt switch S3. Check K1, Q1, Q2 and associated components.
2A	Evaluate POWER SET operation (Models 1107A and 1108A)	Connect test equipment as shown in figure 4-1, test setup B. Adjust the instrument under test for cw operation at low end of frequency range. Refer to paragraphs 2-9 and 2-10a. 1107A: 3.7 GHz 1108A: 6.95 GHz	Power monitor meter deflects to CAL. Power meter indicates presence of signal.	See table 4-3, steps 13A and 14.
2B	Evaluate rf power level of 25 mw (Models 1207A and 1208A)	Repeat step 2A with power meter adjusted to obtain a reference indication of 25 milliwatts.	Power meter indicates 25 milliwatts.	See table 4-3, steps 13B and 14.
3	Evaluate frequency readout accuracy.	Connect test equipment as shown in figure 4-1, test setup A. Adjust frequency meter to determine signal frequency at the following FREQUENCY GHz readout settings: 1107A/1207A: 3.70, 4.50, 5.50, 6.50, 7.50, 8.40 1108A/1208A: 7.00, 7.50, 8.00, 8.50, 9.00, 9.50, 10.00, 10.50, 11.00 **Note** All frequency checks should be made at an output power level of 1 milliwatt. Set ΔF control to zero.	Frequency meter reading is within ±0.5% of FREQUENCY GHz readout. 1107A/1207A Limits: 3.682 to 3.718; 4.478 to 4.522; 4.473 to 5.527; 6.468 to 6.532; 7.470 to 7.530; 8.358 to 8.442 1108A/1208A Limits: 6.965 to 7.035; 7.470 to 7.530; 7.960 to 8.040; 8.458 to 8.542; 8.955 to 9.045; 9.453 to 9.547; 9.950 to 10.050; 10.448 to 10.552; 10.945 to 11.055	Refer to paragraph 4-24.

TABLE 4-2. MINIMUM PERFORMANCE STANDARDS

Step	Purpose	Procedure	Normal Indication	Abnormal Indication Ref.
4A	Evaluate maximum power output (Models 1107A and 1108A)	Connect test equipment as shown in figure 4-1, test setup B. At the frequencies listed below, check for maximum uncalibrated power output of +10 dbm and maximum calibrated power output of +3 dbm. (+10 dbm at 9.00 and 11.00 GHz). 1107A / 1108A 4.00 / 7.00 6.00 / 9.00 8.00 / 11.00	±2.0 db absolute accuracy at +3 dbm. **Note** The uncalibrated power output for 1107A is +10 dbm, minimum. The uncalibrated output for 1108A is +13 dbm, minimum at 7.00 GHz and +10 dbm at 9.00 and 11.00 GHz.	Refer to paragraph 4-16.
4B	Evaluate maximum power output (Models 1207A and 1208A)	Repeat step 4A and check for maximum power output at the frequencies listed below. 1207A / 1208A 4.00 / 6.95 6.00 / 9.00 8.00 / 11.00	1207A: 3.7-4.3 GHz > 60 mw, typically >100 mw; 4.3 - 5.0 GHz > 25 mw, typically > 35 mw; 5.0 - 6.6 GHz > 55 mw, typically > 200 mw (above 5.5 GHz); 6.6 - 8.4 GHz > 35 mw, typically 100 mw 1208A: 6.95 - 8.0 GHz >75 m2, typically >100 mw; 8.0 - 9.5 GHz >30 mw, typically >75 mw; 9.5 - 11.0 GHz >40 mw, typically >50 mw.	Refer to paragraph 4-16.
5	Evaluate attenuator accuracy (Models 1107A and 1108A)	Connect test equipment as shown in figure 4-1, test setup C. At the frequencies listed below, check attenuator accuracy at +3, 0, -5, -10, -15, -20, -25, -30, -35, and -40 dbm. 1107A / 1108A 4.00 / 6.95 6.00 / 9.00 8.00 / 11.00	±1.5 db relative accuracy	Refer to paragraph 4-16.
6	Evaluate square wave operation	Connect test equipment as shown in figure 4-1, test setup D. a. Set MODULATION SELECTOR switch to SQ. WAVE and vary SQ. WAVE FREQ. control. Check square wave frequency with oscilloscope.	a. Square wave frequency varies from 800 to 1200 Hz.	See table 4-3, step 8A or 8B.

TABLE 4-2. MINIMUM PERFORMANCE STANDARDS

Step	Purpose	Procedure	Normal Indication	Abnormal Indication Reference
6 (Cont'd)		b. Observe on-off ratio on oscilloscope.	b. On-off ratio on oscilloscope.	
7	Evaluate internal FM operation	Connect test equipment as shown in figure 4-1, test setup A. a. Set MODULATION SELECTOR switch to INT FM and vary SQ. WAVE FREQ. control. Check sweep rate with oscilloscope. b. Vary FM AMPLITUDE control and check sweep width with frequency meter.	a. Sweep rate varies from 800 to 1200 sweeps per second. b. Sweep width varies up to 5.0 MHz through most of band. **Note** The sweep may not be symmetrical about the center frequency.	See table 4-3, step 9A or 9B.
8	Evaluate external FM operation	Connect test equipment as shown in figure 4-1, test setups A and E. Set MODULATION SELECTOR switch to EXT FM and vary FM AMPLITUDE control on Model 1020 Modulator. Check sweep width with frequency meter.	Sweep width varies up to ±5.0 MHz through most of band.	See table 4-3, step 10A or 10B.
9	Evaluate external pulse operation	Connect test equipment as shown in figure 4-1, test setups D and E. Set MODULATION SELECTOR switch to EXT PULSE and vary RATE control and switch on Model 1020 Modulator. Check pulse rate on oscilloscope.	Pulse rate varies from 10 Hz to 10,000 Hz with no pulse delay. **Note** Using Model 1020 as the external pulse source, the modulation duty cycle will be exceeded if a pulse rate higher than approximately 350 Hz is used at the maximum delay of 2000 usec.	See table 4-3, step 11A or 11B.

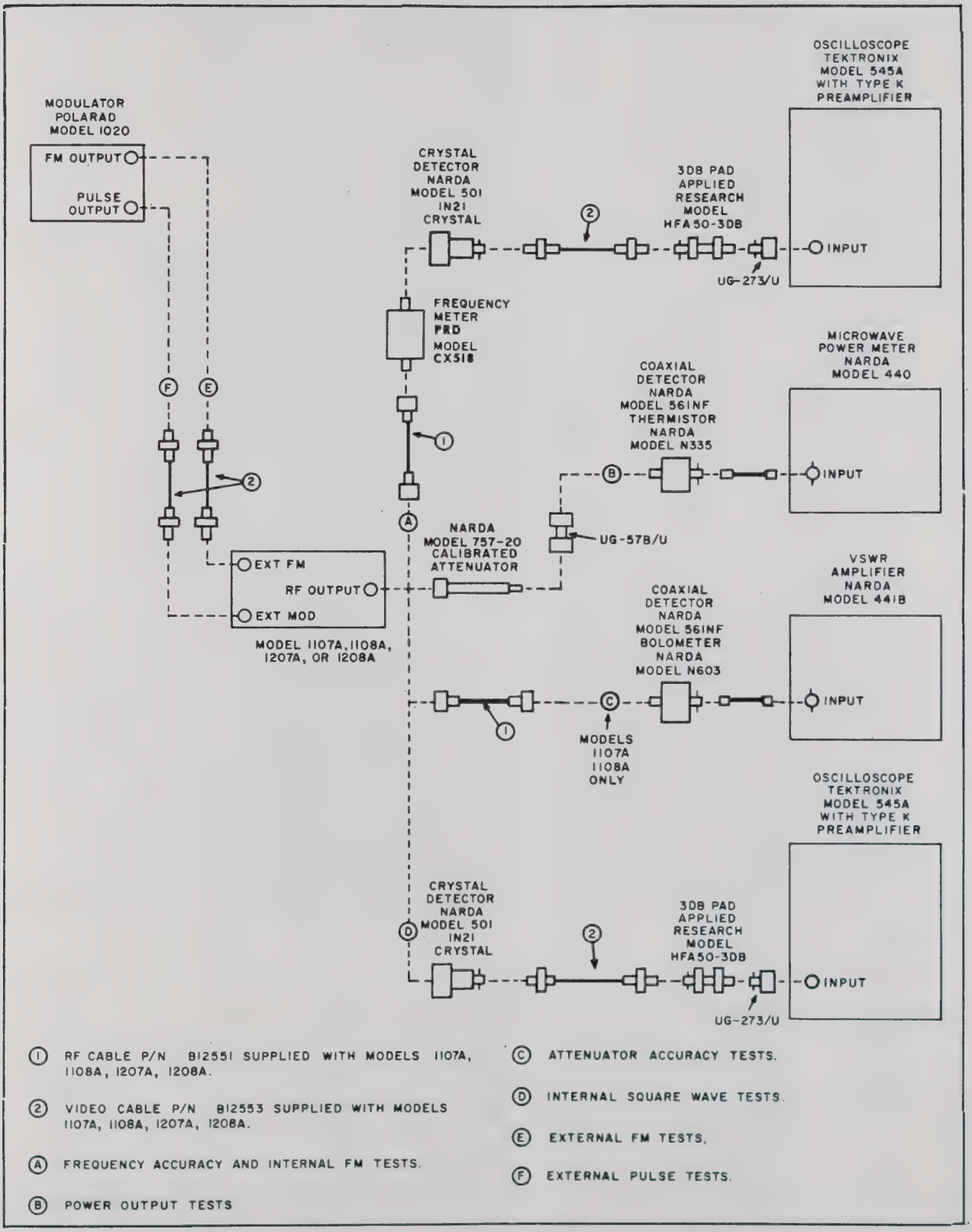


Figure 4-1. Minimum Performance Standards Test Setups

TABLE 4-3. TROUBLESHOOTING PROCEDURE

Step	Purpose	Procedure	Normal Indication	If Indication is Abnormal
1	Check beam current.	a. Set multimeter for 120 ma range and connect it to TP1, using a telephone plug. b. Set MODULATION SELECTOR switch to CW. c. Allow the instrument to warm up for 15 minutes.	Multimeter will indicate a beam current of 22 ma ±10%. Proceed to step 2.	Refer to paragraph 4-22. Check klystron tube V11 and associated circuitry. Check voltage and resistance values listed in table 5-1.
2	Check beam power supply voltage.	a. Set differential voltmeter and voltbox for 5000 volt dc range. b. Connect voltmeter + lead to chassis and - lead to TB1-2.	Differential voltmeter will indicate a beam power supply voltage of 1250 volts ±1%. Proceed to step 3.	Refer to paragraph 4-20.
3	Check repeller power supply voltage.	Disconnect voltmeter - lead from TB1-2 and connect it to TP2.	Voltmeter will indicate a repeller power supply voltage of 1750/1850 volts ±1%. Proceed to step 4.	Refer to paragraph 4-21.
4	Check breakdown diode voltage drop.	a. Disconnect voltmeter. b. Set voltmeter for 60-volt dc range. c. Connect voltmeter - lead to TB1-2 and + lead to V5-1.	Voltmeter will indicate 25 volts ±20%. Proceed to step 5.	Check breakdown diode CR14 and associated circuitry.
5	Check 150-volt power supply.	a. Set voltmeter for 600 volt dc range. b. Disconnect voltmeter - lead from TB1-2 and connect it to V7-4.	Voltmeter will indicate 150 volts ±5%. Proceed to step 6.	Check V7 and associated circuitry.
6	Check klystron filament power supply.	a. Disconnect voltmeter. b. Set voltmeter for 12 volt dc range. c. Connect voltmeter - lead to TB1-3 and + lead to TB1-4.	Voltmeter will indicate 6.3 volts. Proceed to step 7.	Check CR91, CR92, and associated circuitry.

TABLE 4-3. TROUBLESHOOTING PROCEDURE (CONT'D)

Step	Purpose	Procedure	Normal Indication	If Indication is Abnormal
7A	Check cw operation. (Models 1107, 1108 only)	a. Disconnect multimeter. b. Set FREQUENCY GHz dial to low end of range. c. Adjust POWER SET control for a power monitor indication of CAL. d. Adjust FREQUENCY GHz dial upward in 200 MHz increments and repeat step c at each increment.	Power monitor indication of CAL can be obtained over entire frequency range. Proceed to step 8A.	Check V11, V8, and associated circuitry.
7B	Check cw operation. (Models 1207, 1208)	a. Disconnect multimeter. b. Connect test equipment as shown in figure 4-1, test setup B. c. Set FREQUENCY GHz dial to low end of range. d. Adjust ATTENUATOR control on the Model 1207A for an indication of 25 milliwatts when checking the frequency range of 3.7 GHz to 8.4 GHz. On the Model 1208A, adjust ATTENUATOR control for an indication of 25 milliwatts for 6.95 GHz to 11.0 GHz. e. Adjust FREQUENCY GHz dial upward in 200 MHz increments and repeat step d at each increment.	Power meter indication of 25 milliwatts over the frequency range of 3.7 GHz to 8.4 GHz, on the Model 1207A. On the Model 1208A, power meter indication of 25 milliwatts for 6.95 GHz to 11.0 GHz. Proceed to step 8B.	Check V11, V8, and associated circuitry.
8A	Check square wave operation (Models 1107, 1108 only)	a. Set FREQUENCY GHz dial to mid-range. b. Adjust POWER SET control for a power monitor indication of CAL. c. Set MODULATION SELECTOR switch to SQ. WAVE. d. Vary SQ. WAVE FREQ. control over its range.	Power monitor indication will change to approximately -3 or less when MODULATION SELECTOR switch is set to SQ. WAVE. Power monitor indication will vary slightly with rotation of SQ. WAVE FREQ. control.	Check V9 and associated circuitry.

(CONT'D)

TABLE 4-3. TROUBLESHOOTING PROCEDURE (CONT'D)

Step	Purpose	Procedure	Normal Indication	If Indication is Abnormal
8B	Check square wave operation. (Models 1207A, 1208A)	a. Set FREQUENCY GHz dial to mid-range. b. Adjust ATTENUATOR control on the Model 1207A for an indication of 25 milliwatts when checking the frequency range of 3.7 GHz to 8.4 GHz. On the Model 1208A, adjust ATTENUATOR control for an indication of 25 milliwatts on the power meter for 6.95 GHz to 11.0 GHz. c. Set MODULATION SELECTOR switch to SQ. WAVE. d. Vary SQ. WAVE FREQ. control over its range.	Power meter indication will change by approximately 3 db when the MODULATION SELECTOR switch is set to SQ. WAVE. Power meter indication will vary slightly with rotation of SQ. WAVE FREQ. control.	Check V9 and associated circuitry.
9A	Check internal fm operation. (Models 1107A, 1108A only)	a. Set SQ. WAVE FREQ. and FM AMPLITUDE controls to mid-position. b. Set MODULATION SELECTOR switch to INT FM. c. Vary SQ. WAVE FREQ. control over its range. d. Vary FM AMPLITUDE control over its range.	Power monitor indication will vary slightly as SQ. WAVE FREQ. and FM AMPLITUDE controls are varied.	Check CR61 and associated circuitry.
9B	Check internal fm operation. (Models 1207A, 1208A)	Same as step 9A.	Power meter indication will vary slightly as SQ. WAVE FREQ. and FM AMPLITUDE controls are varied.	Check CR61 and associated circuitry.
10A	Check external fm operation. (Models 1107A and 1108A only)	a. Connect test equipment as shown in figure 4-1, test setups B, E, and F. b. Set MODULATION SELECTOR to EXT FM. c. Set external modulator pulse rate to 1000 Hz. d. Vary external modulator sawtooth amplitude.	Power monitor indication will vary slightly as external modulator sawtooth amplitude is varied.	Check S2 circuits. Refer to table 4-4.

(CONT'D)

TABLE 4-3. TROUBLESHOOTING PROCEDURE (CONT'D)

Step	Purpose	Procedure	Normal Indication	If Indication is Abnormal
10B	Check external fm operation. (Models 1207A, 1208A)	Same as step 10A.	Power meter indication will vary slightly as external modulator sawtooth amplitude is varied.	Check S2 circuits. Refer to table 4-4.
11A	Check external pulse operation. (Models 1107A, 1108A only)	a. Set MODULATION SELECTOR to EXT PULSE. b. Vary external modulator pulse rate.	Power monitor indication will vary slightly as external modulator pulse rate is varied.	Check S2 circuits. Refer to table 4-4.
11B	Check external pulse operation. (Models 1207A, 1208A)	Same as step 11A.	Power meter indication will vary slightly as external modulator pulse rate is varied.	Check S2 circuits. Refer to table 4-4.
12	Check attenuator operation.	a. Connect test equipment as shown in figure 4-1, test setup B. b. Set MODULATION SELECTOR to CW. c. Vary ATTENUATOR control.	Power meter indication will vary in unison with rotation of ATTENUATOR control.	Refer to paragraph 4-16.
13A	Check rf off function. (Models 1107A, 1108A only)	Set MODULATION SELECTOR to RF OFF.	Power monitor indicates zero.	Adjust mechanical zero adjustment of M2. Check S2 circuits.
13B	Check rf off function (Models 1207A, 1208A)	Same as step 13A.	Power meter indicates zero.	Check S2 circuits. Refer to table 4-4.
14	Check power monitor operation. (Models 1107A, 1108A only)	a. Set MODULATION SELECTOR switch to CW. b. Vary POWER SET control. c. Turn off and disconnect instrument.	Power monitor indication varies from -3 to +3 smoothly.	Check meter M2 and associated circuitry.

c. Connect probe connector P6 to the microwave power meter (figure 4-1, test setup B) and adjust power meter for 3 mw range.

d. Tune instrument over its range and determine the frequency at which minimum power output occurs.

Note

Minimum power output for Model 1107A is at approximately 3.70 GHz; for Model 1108A it is at approximately 11.00 Ghz.

e. With instrument tuned to the frequency at which minimum power output is obtained, adjust amount of probe insertion in barrel for a power meter indication of 1.5 mw.

f. Tighten the setscrew that secures the power set probe in the probe block.

g. Disconnect power meter.

h. Dress power set probe cable W3 toward level detector Z1.

i. Install and fasten the cable clamp around W3.

j. Connect P6 to level detector Z1.

4-15. REMOVAL OF ATTENUATOR PROBE ASSEMBLY. To remove the attenuator probe assembly (see figures 4-2 and 4-5), proceed as follows:

a. Loosen setscrew in attenuator probe collar.

b. Carefully pull the probe out of the collar.

c. Unfasten and remove the cable clamp that secures the attenuator probe cable to the casting.

d. Unfasten and remove the ATTENUATOR and FREQUENCY GHz knobs (also POWER SET knob on Models 1107A and 1108A).

e. Unfasten and remove the instrument handles.

f. Remove the screws that secure the front panel and pull the panel forward slightly.

g. Remove the screws that secure the RF OUTPUT connector J1.

h. Feed the connector J1 back out of the panel.

i. Unthread the attenuator probe assembly through the casting hole.

4-16. REPLACEMENT OF ATTENUATOR PROBE ASSEMBLY. To replace the attenuator probe assembly, proceed as follows:

CAUTION

ADVANCING THE ATTENUATOR TOO DEEPLY (MODEL 1108A ONLY) INTO THE KLYSTRON CAVITY WILL DAMAGE THE CAVITY

a. Thread the attenuator probe assembly cable W1 through the casting hole provided, with connector J1 positioned near its mounting holes and the probe tip adjacent to the probe collar. Insert the probe tip through the probe collar and into the attenuator barrel.

b. Mount and fasten connector J1.

c. Replace panel mounting screws, handles, and knobs removed during disassembly.

d. Replace cable clamp.

e. Connect microwave power meter to instrument (figure 4-1, test setup B) and proceed according to the applicable step below.

(1) Models 1107A and 1108A. Operate instrument to obtain power monitor indication of CAL and set attenuator dial to 0 dbm. Adjust probe insertion for power meter reading of 1 mw, then tighten setscrew on probe collar. If necessary, adjust METER CAL control R99 to obtain a power monitor indication of CAL.

(2) Models 1207A and 1208A. Operate instrument to determine frequency at which minimum power out- is obtained (Model 1207A - 3.7 GHZ; Model 1208A - 11.0 GHz) and turn ATTENUATOR control fully clockwise. Adjust probe insertion until power meter reading just starts to drop after reaching a peak then tighten setscrew in probe collar.

f. Disconnect microwave power meter.

4-17. REPLACEMENT OF KLYSTRON OSCILLATOR TUBE V11. To replace the klystron oscillator tube V11, (figure 4-5) proceed as follows:

WARNING

BEFORE REPLACING KLYSTRON DISCONNECT POWER CORD. THEN WITHDRAW PROBES FROM CAVITY BY ROTATING POWER SET (MODEL 1107A ONLY) AND ATTENUATOR CONTROLS FULLY COUNTER-CLOCKWISE.

a. Loosen and slide back the klystron socket clamp.

b. Pull the klystron socket shield back from the oscillator assembly.

c. Carefully remove the klystron socket from the protruding base of the klystron tube.

d. Loosen knurled nut with spanner wrench. Be careful not to let wrench contact klystron tube.

e. Rotate tube clockwise and pull forward simultaneously. Klystron will extract easily.

f. Remove knurled nut and all spacers and springs.

g. Remove springs from cores and discard. Cores should be round (not kinked or bent).

h. Take new spring (be sure that it is stiff). Stretch slightly until spring is no longer stiff, but droops when held by one end. These springs stretch easily and should be handled carefully sincer overstretching cannot be corrected. Now cut approximately one quarter inch length from either end with sharp cutters. Push spring around core. If spring has been cut properly, the opening across two ends of the core will be one quarter inch. If opening is less, then cut a little more from spring. If opening is more, then stretch spring a little more.

i. Repeat above for the other spring and core.

j. Insert one spring and core into cavity with open end down.

k. Insert the thin spacer.

l. Insert the other spring and core into cavity with open end up.

m. Insert larger spacer and screw on knurled nut all the way. Then back off nut three quarters of a turn so that it is loose.

n. Insert new klystron into cavity by pushing straight in until it stops. Now rotate clockwise and push simultaneously until the tube suddenly moves forward and a distinct "click" is heard.* The tube has now passed over the first spring. Continue rotating clockwise and pushing tube until tube moves in again and another "click" is heard. Now rotate tube a quarter turn clockwise and hand tighten knurled nut.

*NOTE: If tube does not move forward, or a grinding sound is heard, the springs have not been stretched enough. They should be corrected. It should also be noted that when pushing tube a fair amount of force is required. If the tube is pushed straight in and not on an angle, this force will not harm tube.

o. Reconnect the klystron tube socket.

p. Replace the klystron socket shield.

q. Replace and tighten the klystron socket clamp.

r. Rotate BEAM CUR ADJ control R44 full counterclockwise.

s. Refer to paragraph 4-25 for the repeller voltage tracking adjustments required after klystron replacement.

4-18. ADJUSTMENT AND CALIBRATION PROCEDURES.

4-19. Instrument adjustment and calibration procedures are given in paragraphs 4-20 through 4-27. After performing any of the adjustment and calibration procedures given below, perform the minimum performance checks given in table 4-2.

4-20. -1250 VOLT ADJUSTMENT. To adjust the -1250 volt supply, proceed as follows:

a. Rotate BEAM CUR ADJ control R44 to midpoint.

b. Set multimeter to 120 ma dc range and connect it to TP1, using a telephone plug.

c. Adjust R44 for an indication of 22 ma on the multimeter.

d. Disconnect the multimeter.

e. Set multimeter for 6000-volt dc range, connect + lead to chassis and - lead to TB-2.

f. Adjust the -1250 ADJ control R17 for a multimeter indication of 1250 volts.

g. Glyptol-lock the shaft of R17.

h. Disconnect multimeter.

4-21. -1750/-1850 (1108A & 1208A) VOLT ADJUSTMENT. To adjust the -1750/-1850 volt supply, proceed as follows:

a. Set multimeter for 6000-volt dc range, connect + lead to chassis and - lead to junction of C37 and R42.

b. Adjust the -1750/-1850 ADJ control R37 for a multimeter indication of 1750/1850 volts.

c. Glyptol-lock the shaft of R37.

d. Disconnect multimeter.

4-22. BEAM CURRENT ADJUSTMENT. To adjust the beam current after adjusting the -1250 and -1750/-1850 volt supplies, proceed as follows:

a. Set multimeter for 120 ma dc range and connect it to TP1, using a telephone plug.

b. Adjust BEAM CUR ADJ control R44 for a multimeter indication of 23 ma.

c. Scan through frequency band and readjust so that 22 ma is maximum at any point.

d. Glyptol-lock the shaft of R44.

e. Disconnect multimeter with the tube oscillating.

4-23. SQUARE WAVE SYMMETRY ADJUSTMENT. To adjust the symmetry of the square wave output, proceed as follows:

a. Connect test equipment as shown in figure 4-1, test setup D.

b. Operate instrument to obtain square wave modulation.

c. Adjust SYMMETRY control R73 for best symmetry of square wave displayed on oscilloscope.

d. Glyptol-lock shaft of R73.

e. Disconnect test equipment.

4-24. KLYSTRON FREQUENCY ALIGNMENT. Due to variations in klystron repeller voltage characteristics and other parameters, the tuning cam and repeller voltage adjustments must be made whenever the klystron is replaced or the performance of the instrument does not meet the minimum performance requirements of table4-2. To align the klystron for frequency and repeller voltage tracking, proceed as follows:

Note

The voltage and current adjustments of paragraphs 4-20 through 4-22 must be performed before klystron alignment is begun.

a. Connect test equipment as shown in figure 4-6.

Note

If a component in the repeller voltage tracking circuitry has been replaced, or the glyptol locks on the tracking potentiometers have been broken, set all tracking potentiometers to their midpoints before proceeding with klystron alignment. If only the klystron has been replaced, this preliminary rough setting is not required.

b. Set MODULATION SELECTOR switch to CW.

c. Apply power to instrument and test equipment and allow them to warm up for 15 minutes.

d. Rotate frequency control knob to position the cam follower at the fixed point on the tuning cam shown in figure 4-7.

Note

Set ΔF control at zero.

e. Check the FREQUENCY GHz readout. It should be about 5.9 GHz for Models 1107A and 1207A, or 8.85 GHz for Models 1108A and 1208A.

f. Adjust klystron mode alignment modulator and oscilloscope to obtain a stable display of the klystron mode pattern, similar to figure 4-8, pattern C.

g. Tune frequency meter to place dip due to frequency meter at peak of mode pattern as shown in figure 4-8, pattern D.

h. Frequency meter reading should be within ±0.1% of FREQUENCY GHz readout. If it is not, loosen socket head screw in cam follower yoke (figure 4-2) and adjust push rod yoke to bring frequency within tolerance. Retune frequency meter to check push rod yoke adjustment and then tighten socket head screw.

i. Rotate frequency control knot to position eccentric adjustment 4 (5 on Models 1108A and 1208A) (figure 4-7) opposite cam follower. Tune frequency meter to check instrument frequency, which should be within ±0.5% of FREQUENCY GHz readout. If frequency is not within tolerance, loosen the four nuts (three on Models 1108A and 1208A) on the underside of the tuning cam for adjustments 4, 5, 6, and 7.

Note

If adjustment 4 (5 on Models 1108A and 1208A) requires change, loosen all four nuts. If only one of the other adjustments requires change, loosen that nut only and take care that the cam is not distorted.

j. (Models 1107A, 1207A only.) To bring instrument frequency within tolerance for adjustment 4, set frequency meter to the FREQUENCY GHz readout value for adjustment 4. Adjust hex nut 4 until frequency is within tolerance. Hold hex nut 4 with a wrench and tighten nut on underside of tuning cam with another wrench. Recheck frequency after tightening adjustment, and, if necessary, repeat adjustment after loosening nut on underside of tuning cam.

k. Rotate frequency control knob to position eccentric adjustment 5 opposite cam follower. Repeat procedure of steps i, j, and k for adjustment 5, 6, (Models 1107A, 1207A only), and 7.

l. After making adjustment 7, recheck all frequencies for adjustments 6, 5, and 4 (Models 1107A and 1207A only).

m. Repeat step d. Frequency should be within ±0.5% of FREQUENCY GHz readout.

n. Rotate frequency control knob to position eccentric adjustment 3 opposite cam follower. Instrument frequency should be within ±0.5% of FREQUENCY GHz readout. If frequency is not within tolerance, loosen the three nuts on the underside of the tuning cam for adjustments 3, 2, and 1.

o. To bring instrument frequency within tolerance, adjust hex nut 3 until frequency is within tolerance, then tighten nut on underside of cam while holding adjustment 3 with a wrench.

p. Repeat steps n and o for adjustments 2 and 1.

q. After making adjustment 1, recheck frequencies for adjustments 1, 2, and 3. If necessary, repeat steps n, o, and p.

r. Leave test setup operating for repeller tracking adjustments.

4-25. REPELLER VOLTAGE TRACKING ADJUSTMENTS. After completing the klystron frequency alignment of paragraph 4-24, proceed with the repeller voltage tracking adjustments given below. If the proper mode display is obtained prior to adjustment, omit the adjustment. The typical repeller voltage vs frequency characteristics for Models 1107A and 1207A are shown in figure 4-9 and the typical repeller voltages vs frequency characteristics for Models 1108A and 1208A are shown in figure 4-10.

a. Rotate the frequency control knot to the low end of the frequency range of the instrument. (Models 1107A and 1207A - 3.70 GHz. Models 1108A and 1208A - 6.95 GHz).

b. Set MODULATION SELECTOR switch to EXT FM.

c. If the mode pattern appears as in A of figure 4-8, the repeller voltage is not correct for the klystron frequency. Adjust R82 to center the mode patpern, as in B and adjust the PHASE control of the klystron mode alignment modulator to phase the mode pattern, as in C.

d. Rotate the frequency control knob to the point just before the mode switch S4 operates. If necessary, adjust R83 to center the mode pattern.

e. Rotate the frequency control knob to the point just after the mode switch S4 operates. If necessary, adjust R85 to center the mode pattern (Models 1108A and 1208A only).

f. Rotate the frequency control knob to the high end of the frequency range of the instrument (Models 1108A and 1208A only).

g. Rotate the frequency control knob to the point just after the mode switch S4 operates. Adjust R87 to center the mode pattern (Models 1107A and 1208A only).

h. Rotate the frequency control knob to the point just before the mode switch S5 operates. If necessary, adjust R84 to center the mode pattern (Models 1107A and 1207A only).

i. Rotate the frequency control knob to the point just after the mode switch S5 operates. If necessary, adjust R85 to center the mode pattern (Models 1107A and 1207A only).

j. Rotate the frequency control knob to the high end of the frequency range of the instrument. (Model 1107A: 8.4 GHz).

k. If necessary, adjust R86 to center the mode pattern.

l. Rotate the frequency control knob to cover the complete frequency range of the instrument. The mode pattern displayed on the oscilloscope should be continuous, should remain centered, should not split into a double pattern, and should not exhibit a loss of power at any point in the frequency range. However, there should be an abrupt change in power level at the mode switching point.

m. Glyptol-lock the shafts of all tracking potentiometers. (Models 1107A and 1207A - R82, R83, R84, R85, R86, and R87, Models 1108A and 1208A - R82, R83, R85, and R86.).

n. Leave test setup operating for power output check.

Note

Models 1107A and 1108A only. If the power monitor meter M2 does not indicate CAL when the output level at the RF OUTPUT connector J1 is 0 dbm or 1 mw, adjust METER CAL control R99 for a meter indication of CAL.

4-26. POWER OUTPUT CHECK. To check the power output of the instrument, perform steps 1, 2A or 2B, 4A or 4B, and 5 of table 4-2.

Note

If the probe is allowed to remain at a fixed position for all frequencies, it is possible that at some frequencies the oscillator will stop oscillating. At these points the probe should be retracted and reset for maximum output.

4-27. FINAL CHECK. To check the overall performance of the instrument, perform steps 3 and 6 through 9 of table 4-2. Replace top and bottom dust covers.

TABLE 4-4. MODULATION SELECTOR SWITCH S2 POSITIONS AND CIRCUITS

Section	POSITION AND CIRCUIT					
	RF OFF	CW	SQ. WAVE	INT FM	EXT FM	EXT PULSE
S2-1A	NC	NC	12-4	12-4-5	12-5	NC
S2-1B	6-7	7-10	6-7	7-10	7-10	6-7
S2-2A ↑ Rotors Connected ↓			4 ↕			
S2-2B	8-10	8-10	10	8-10	8-10	10-1
S2-3A ↑ Rotors Connected ↓				3 ↕	4 ↕	
S2-3B	8-10	8-10	8-10	10	10	8-10

NOTES: NC - No connection

↕ - Rotor-to-rotor circuit
Refer to figures 5-1 through 5-4 for section contact numbers.

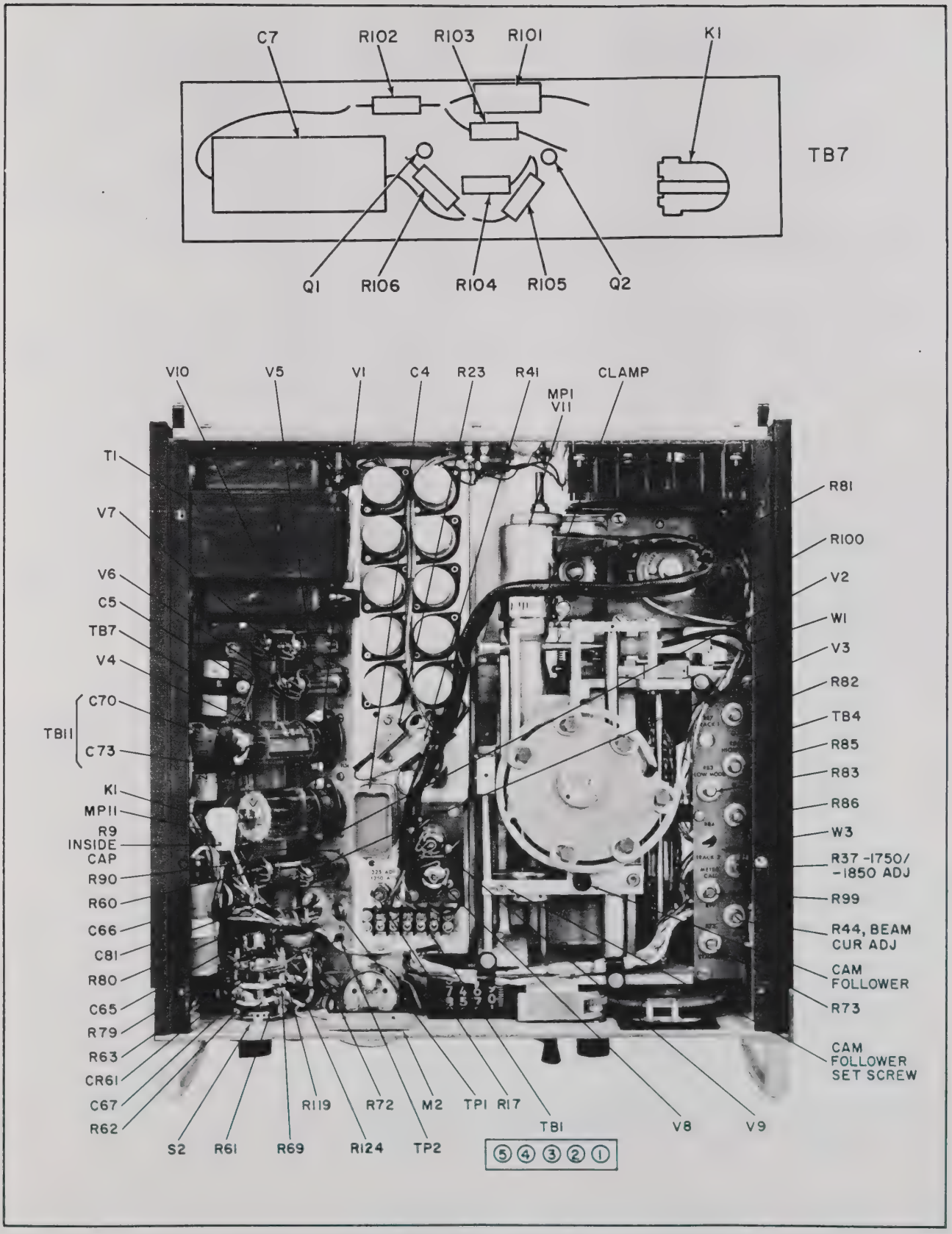


Figure 4-2. Models 1107A, 1108A, 1207A, and 1208A Chassis, Top View

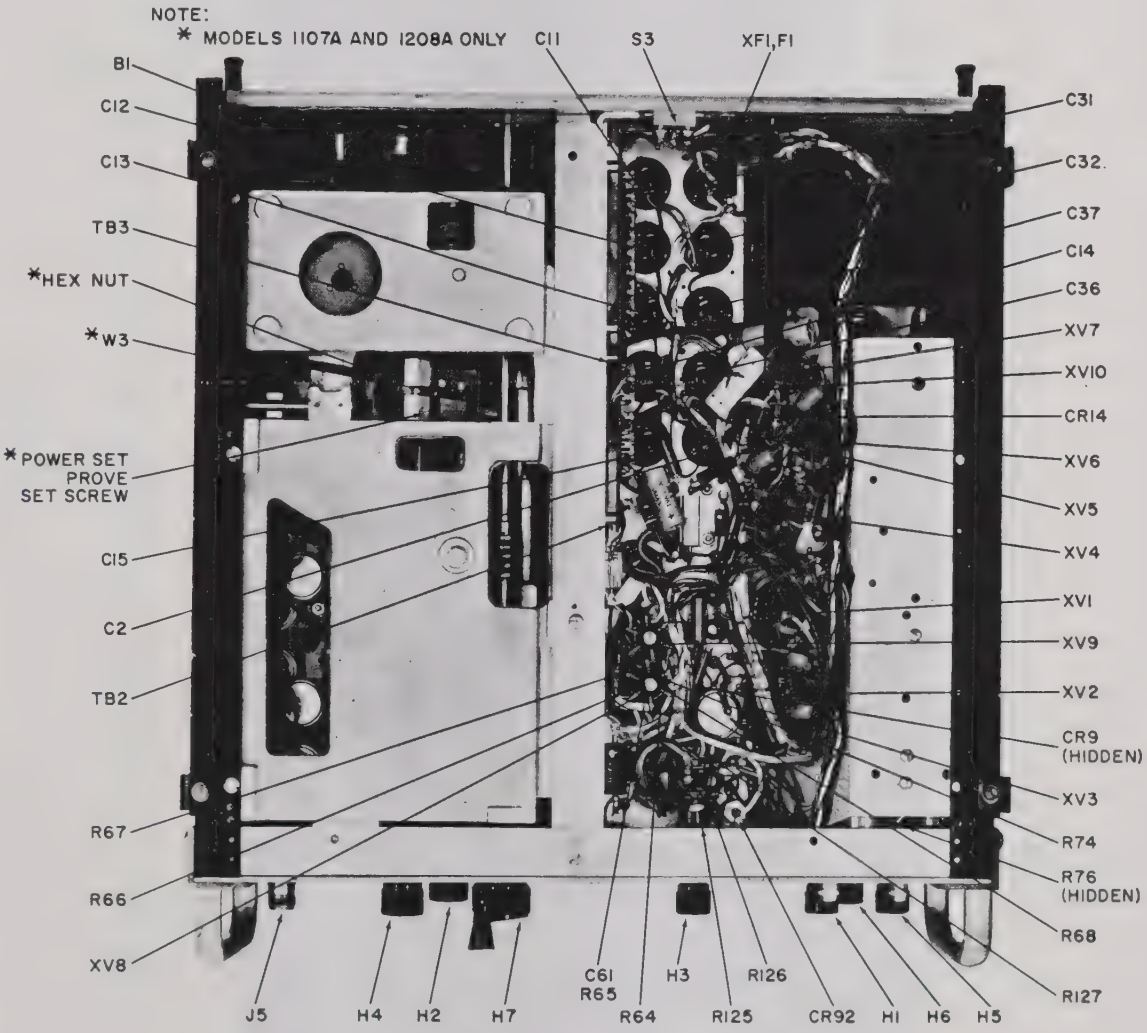


Figure 4-3. Models 1107A, 1108A, 1207A, and 1208A Chassis, Bottom View (Sheet 1 of 2)

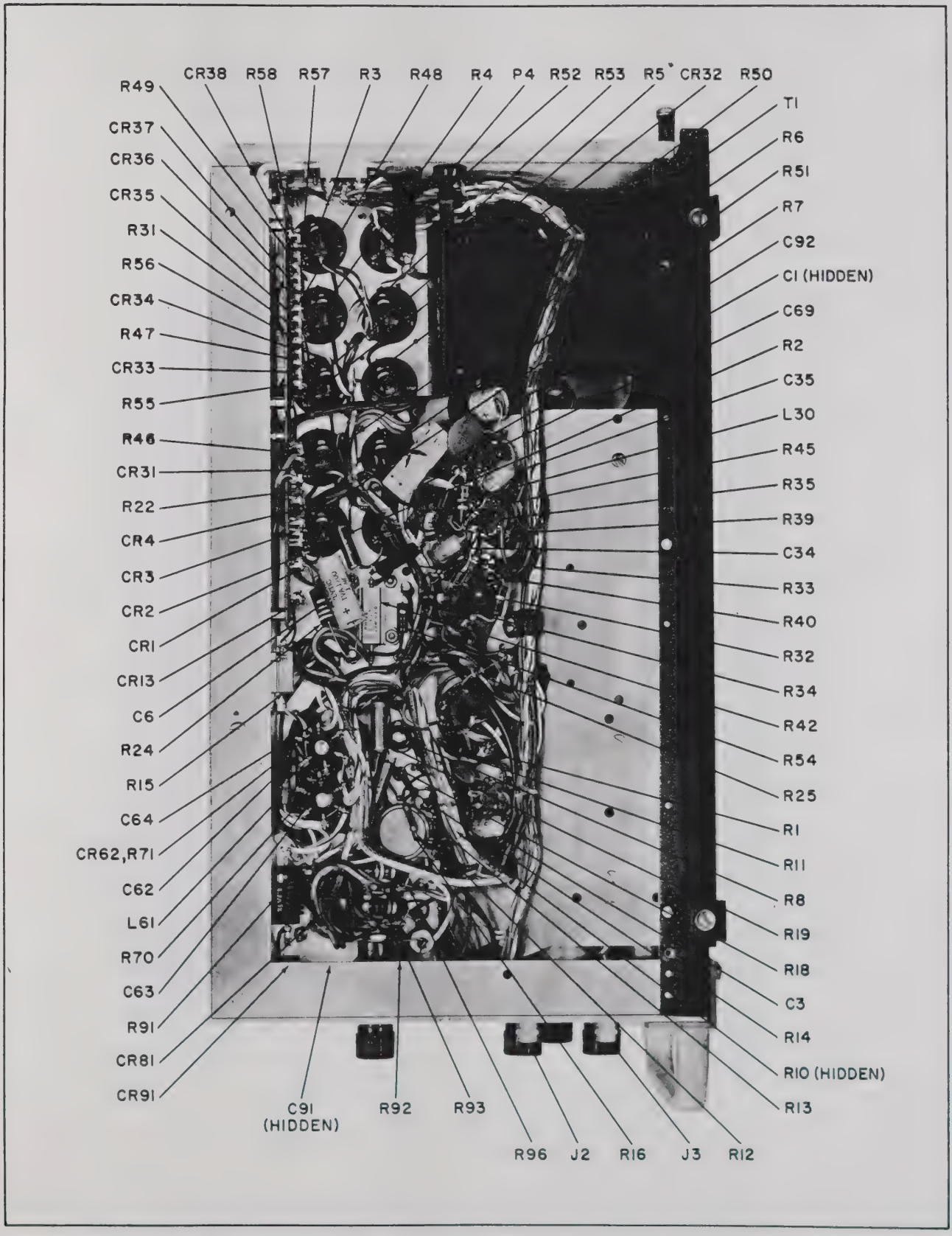


Figure 4-3. Models 1107A, 1108A, 1207A, and 1208A Chassis, Bottom View (Sheet 2 of 2)

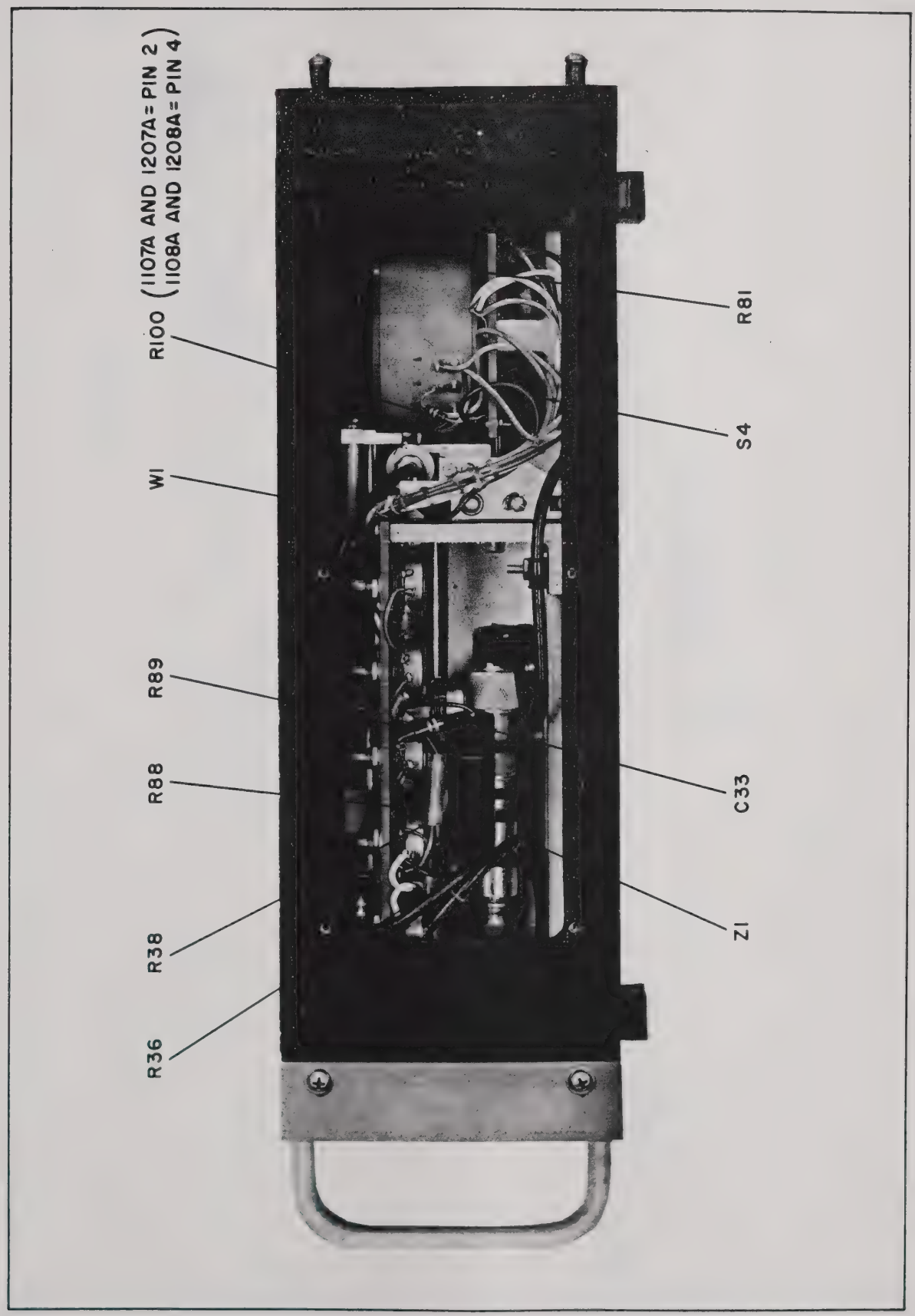


Figure 4-3A. Models 1107A, 1108A, 1207A, and 1208A Chassis, Side View

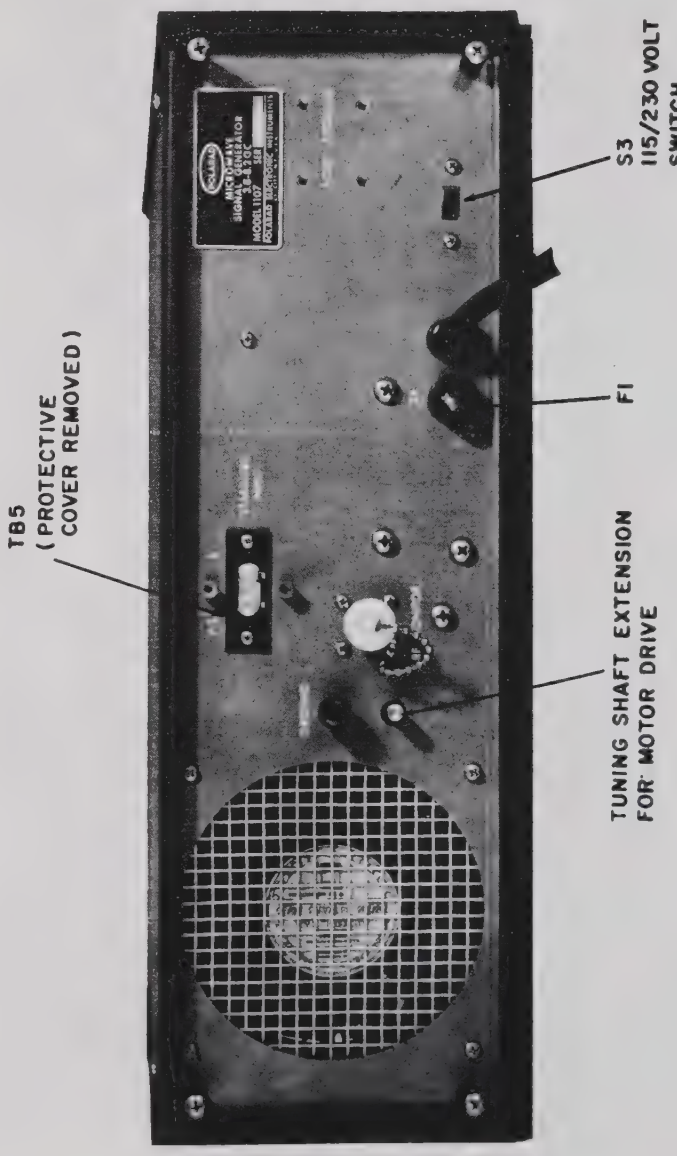


Figure 4-4. Models 1107A, 1108A, 1207A, and 1208A Chassis, Rear View

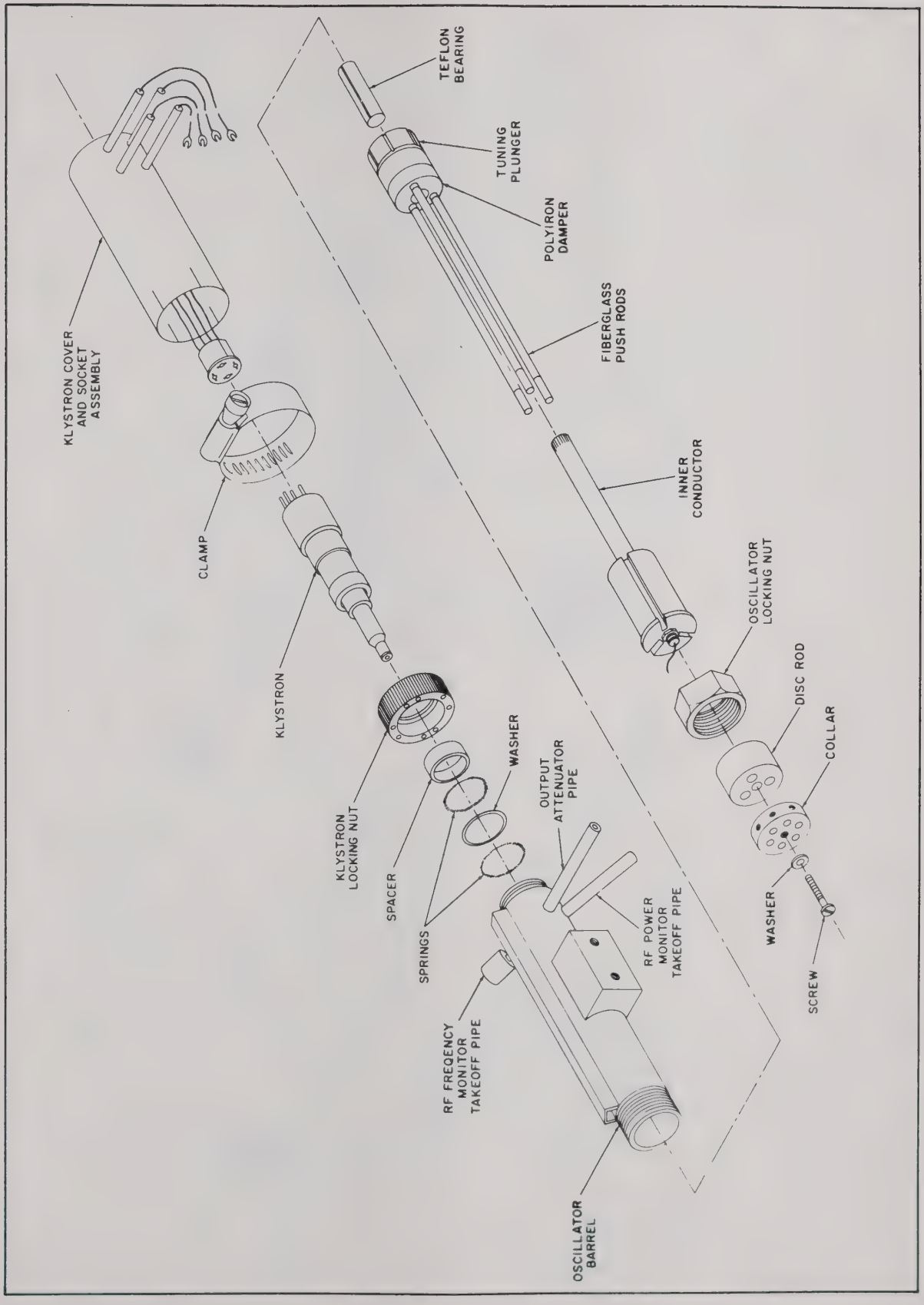


Figure 4-5. Klystron Cavity, Exploded View (Models 1107A and 1207A)

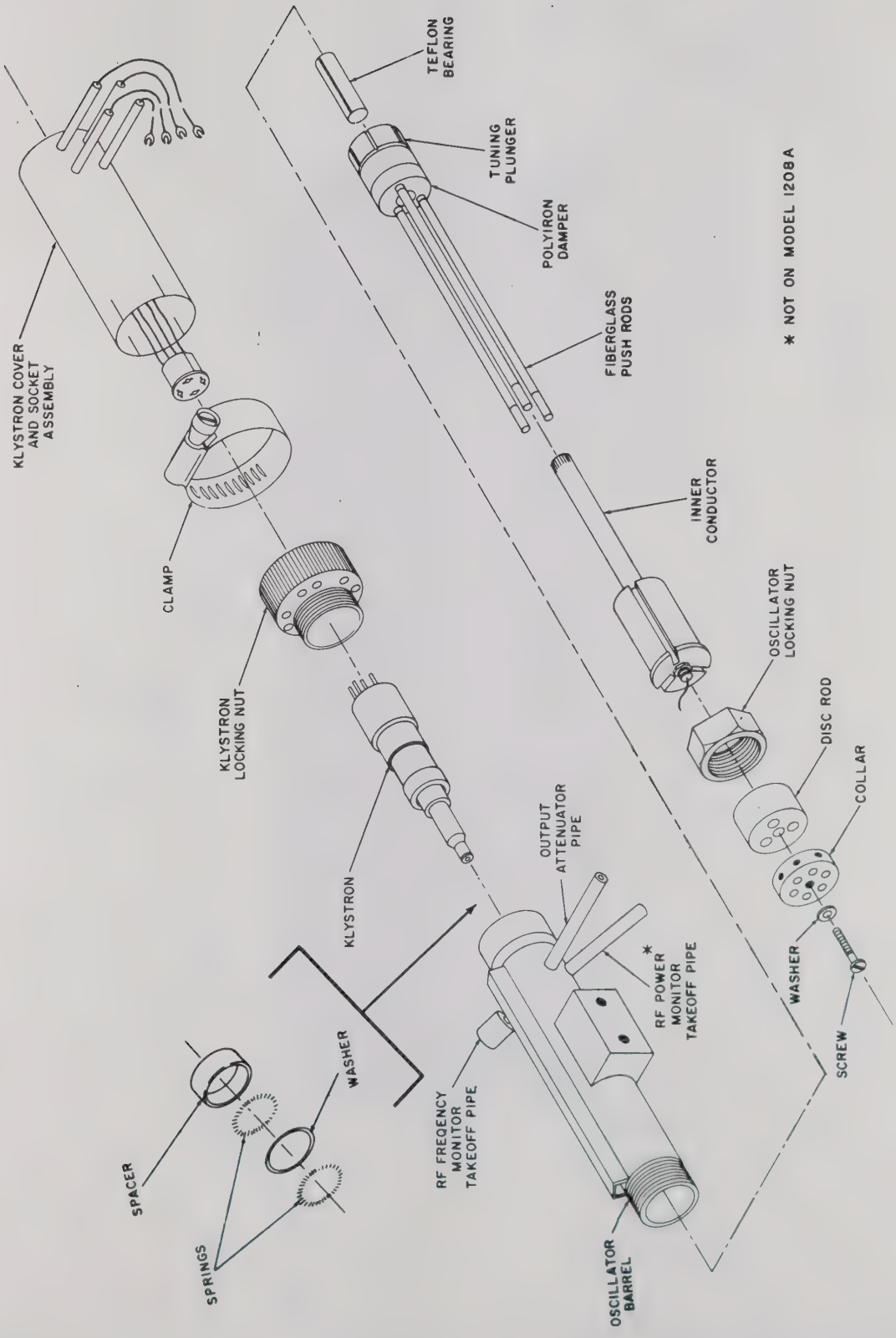


Figure 4-5A. Klystron Cavity, Exploded View (Models 1108A and 1208A)

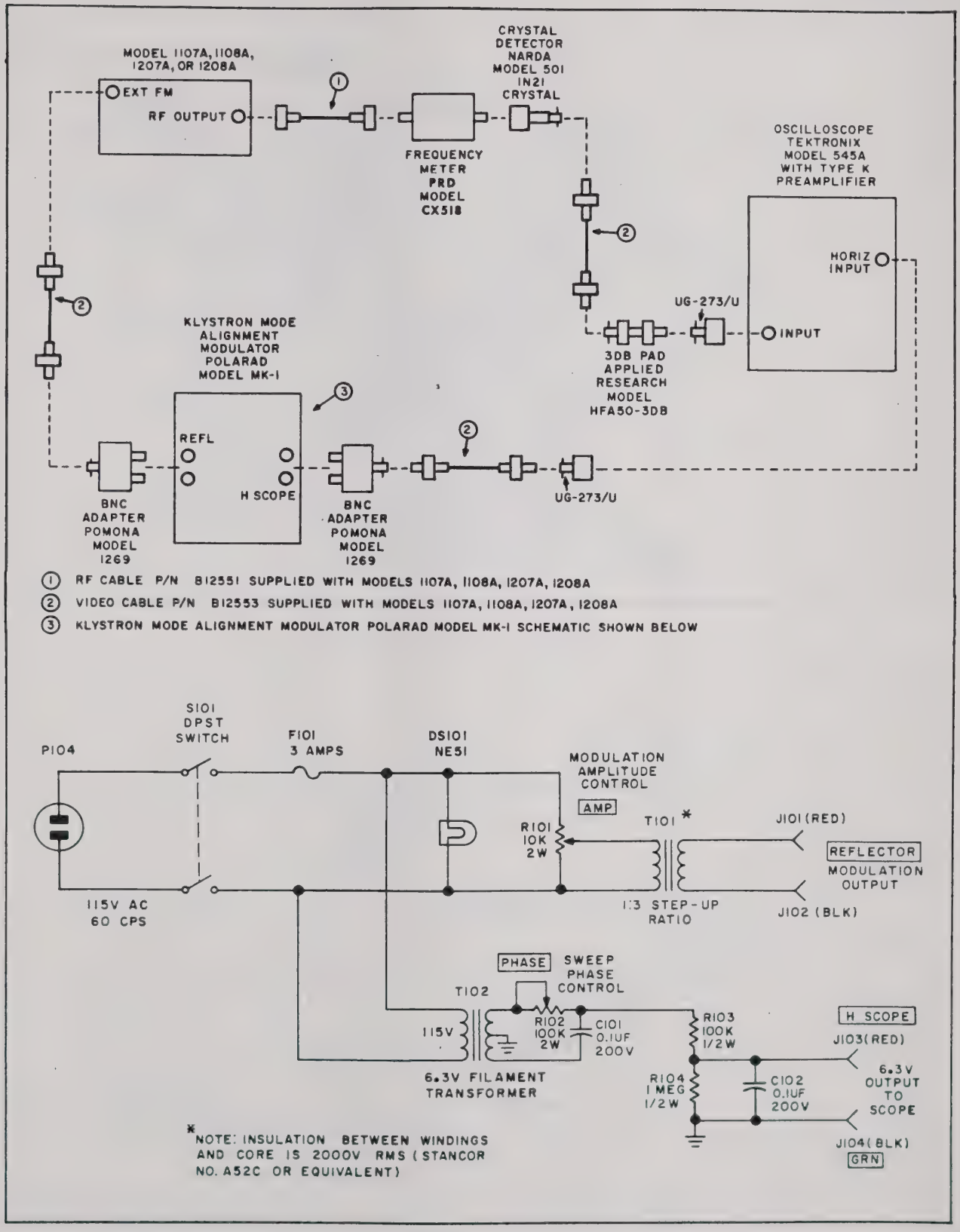


Figure 4-6. Test Setup for Klystron Frequency and Repeller Tracking Adjustments

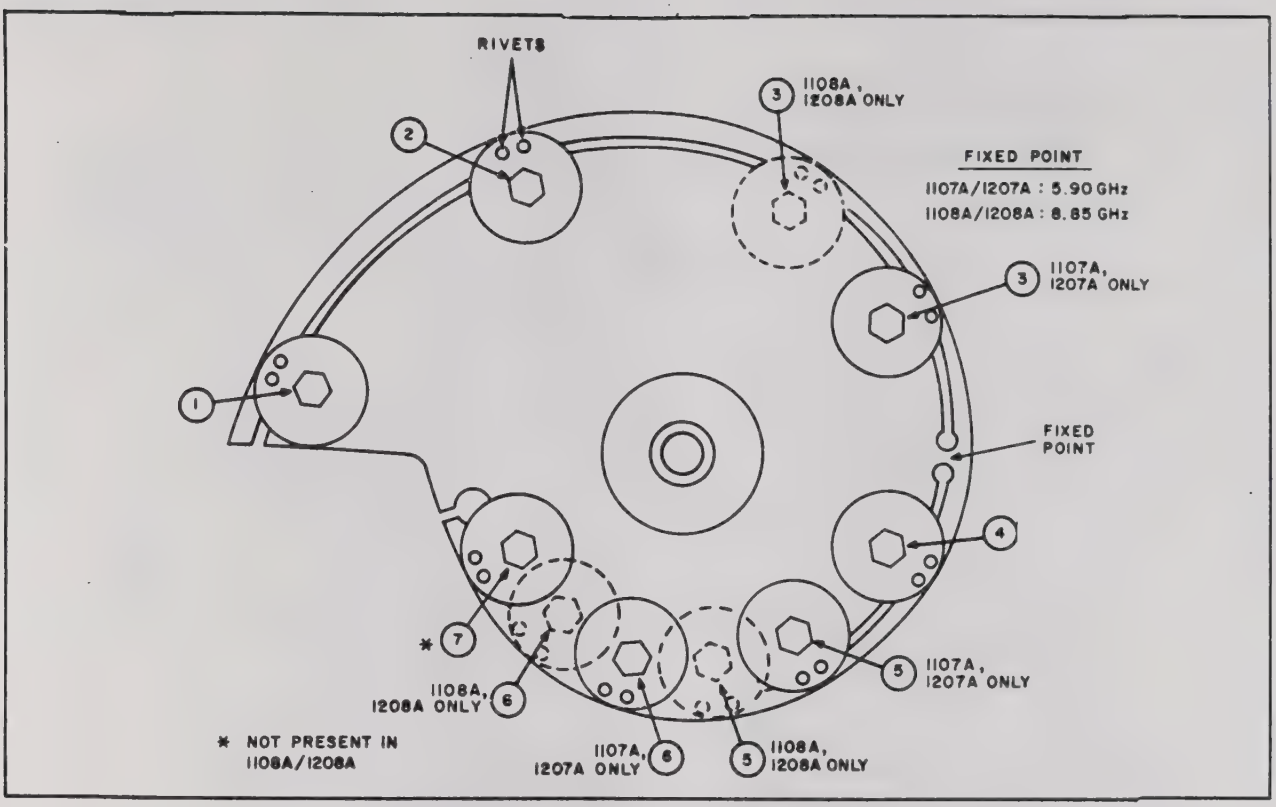


Figure 4-7. Tuning Cam Adjustments

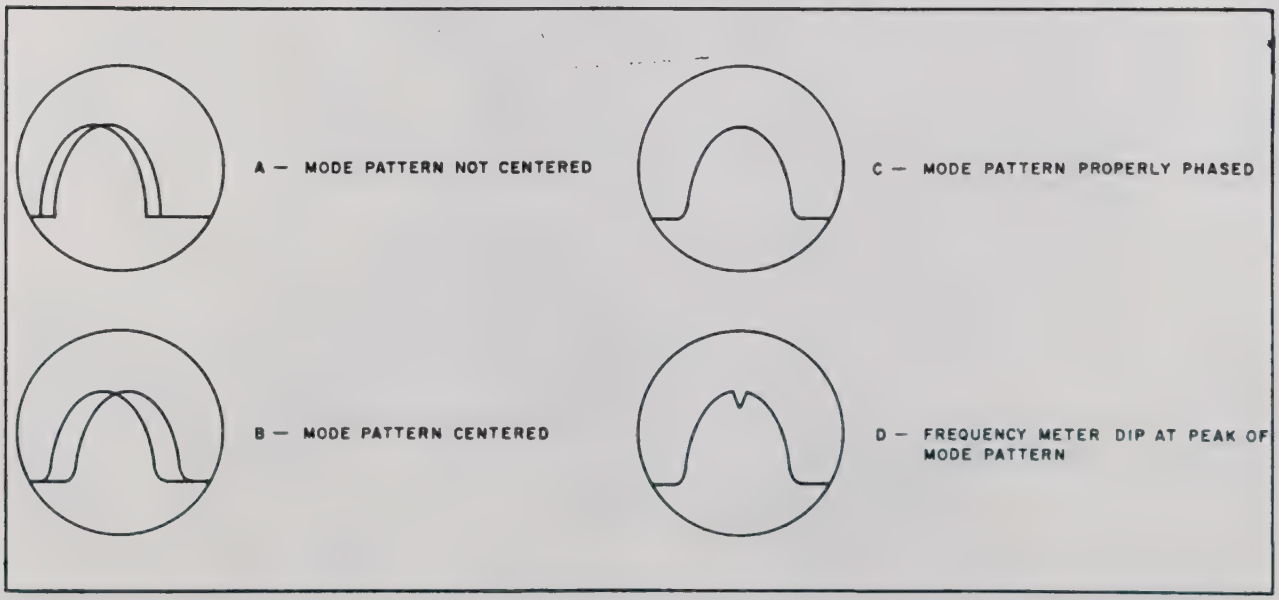

A — MODE PATTERN NOT CENTERED
C — MODE PATTERN PROPERLY PHASED
B — MODE PATTERN CENTERED
D — FREQUENCY METER DIP AT PEAK OF MODE PATTERN

Figure 4-8. Mode Patterns

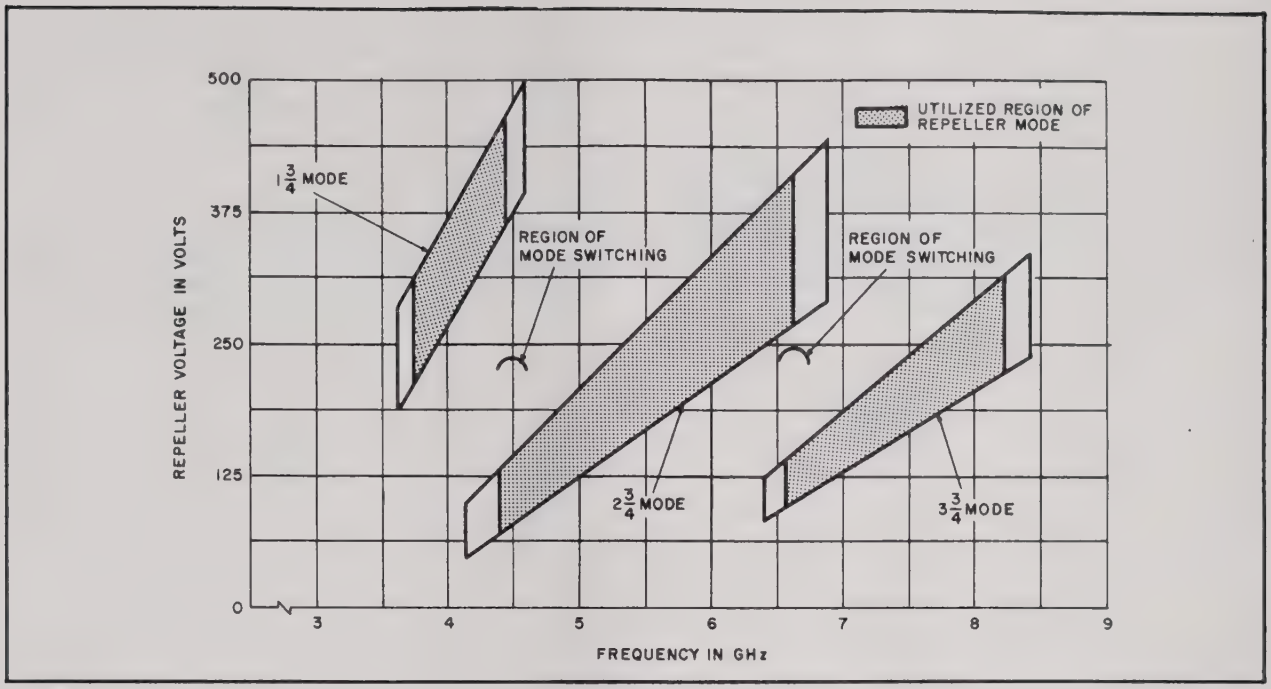


Figure 4-9. Typical Repeller Voltage Vs Frequency Characteristics, Models 1107A and 1207A

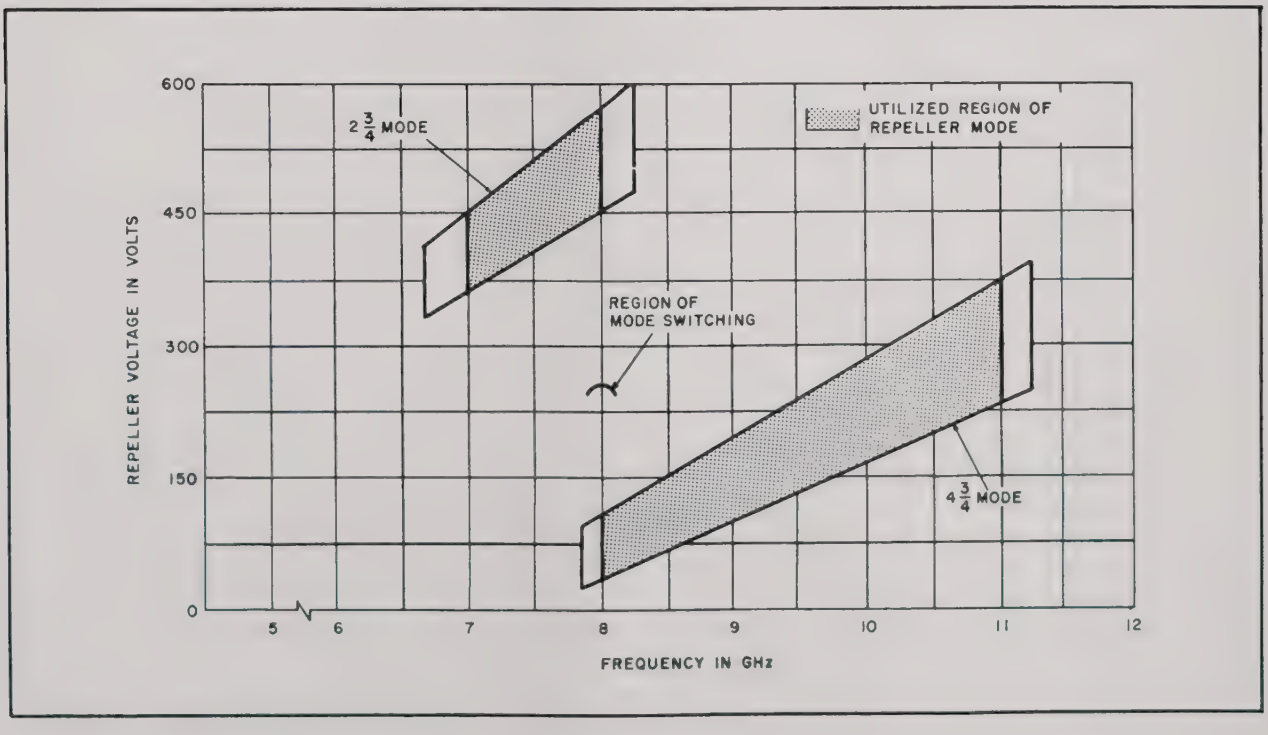


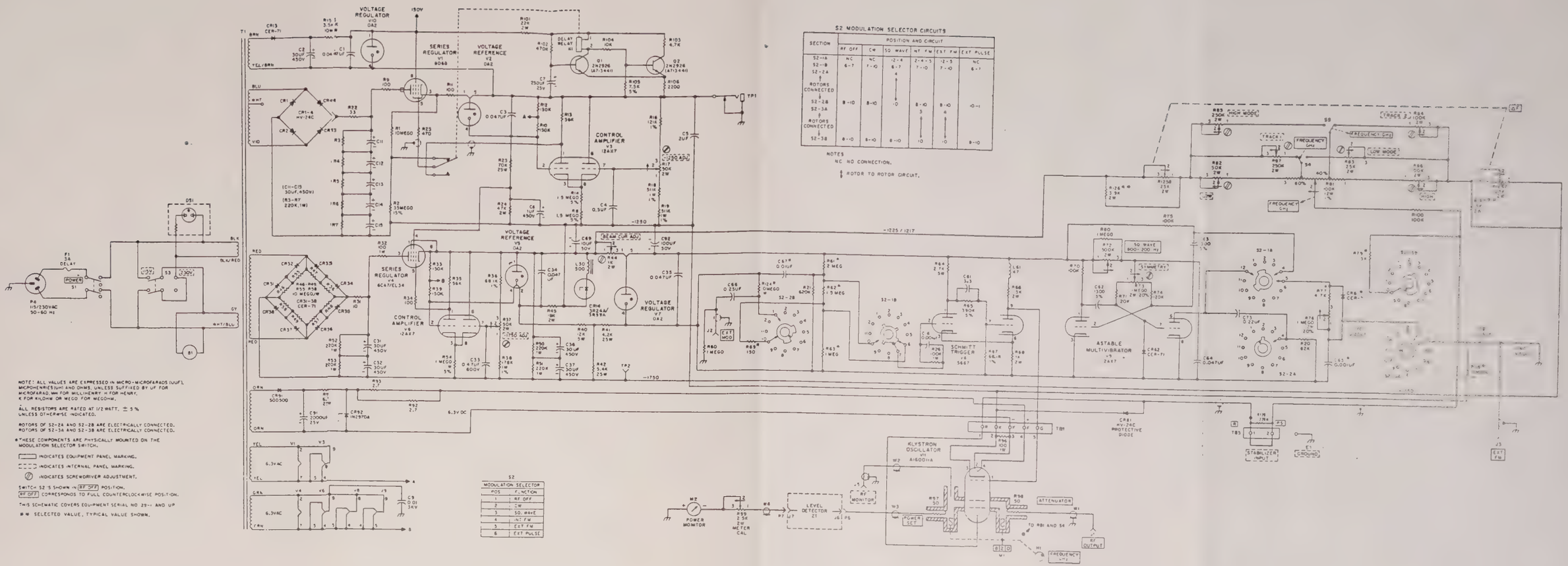
Figure 4-10. Typical Repeller Voltage Vs Frequency Charcteristics, Models 1108A and 1208A

SECTION V

SCHEMATIC DIAGRAMS

5-1. GENERAL.

5-2. This section contains the schematic diagrams (figures 5-1 through 5-4) and voltage and resistance measurements (table 5-1) that are essential aids in the maintenance of the Models 1107A, 1108A, 1207A, and 1208A. The diagrams are to be employed in conjunction with Section III to help the technician understand the operation of the units. Both the diagrams and the voltage measurements are to be used in conjunction with Section IV to facilitate troubleshooting and maintenance operations.



NOTE: ALL VALUES ARE EXPRESSED IN MICRO-MICROFARADS (UUF), MICROMENRIES(UH) AND OHMS, UNLESS SUFFIXED BY UF FOR MICROFARAD, MH FOR MILLIHENRY, H FOR HENRY, K FOR KILOHM OR MEG FOR MEGOHM.

ALL RESISTORS ARE RATED AT 1/2 WATT, ± 5% UNLESS OTHERWISE INDICATED.

ROTORS OF S2-2A AND S2-2B ARE ELECTRICALLY CONNECTED. ROTORS OF S2-3A AND S2-3B ARE ELECTRICALLY CONNECTED.

* THESE COMPONENTS ARE PHYSICALLY MOUNTED ON THE MODULATION SELECTOR SWITCH.

▭ INDICATES EQUIPMENT PANEL MARKING.

▭ INDICATES INTERNAL PANEL MARKING.

⊘ INDICATES SCREWDRIVER ADJUSTMENT.

SWITCH S2 IS SHOWN IN RF OFF POSITION.
RF OFF CORRESPONDS TO FULL COUNTERCLOCKWISE POSITION.

THIS SCHEMATIC COVERS EQUIPMENT SERIAL NO 29-- AND UP

Figure 5-1. Model 1107A Modular Microwave Signal Generator, Schematic Diagram

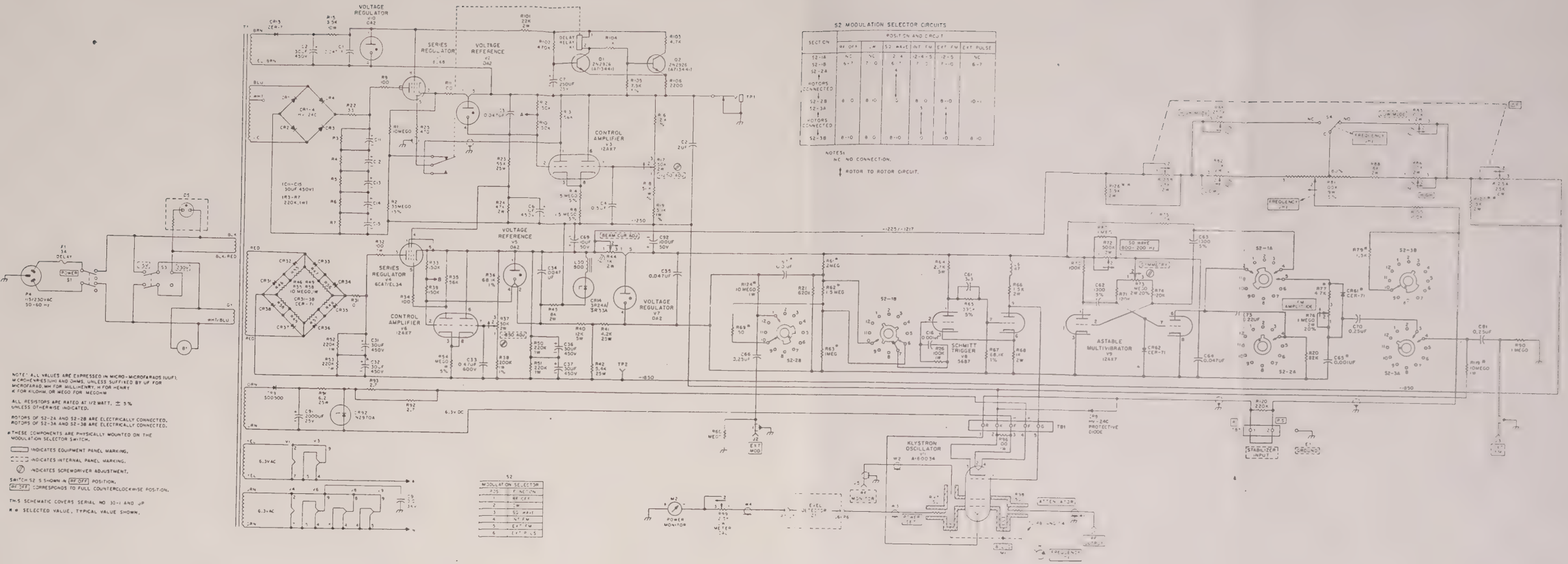


Figure 5-2. Model 1108A Modular Microwave Signal Generator, Schematic Diagram

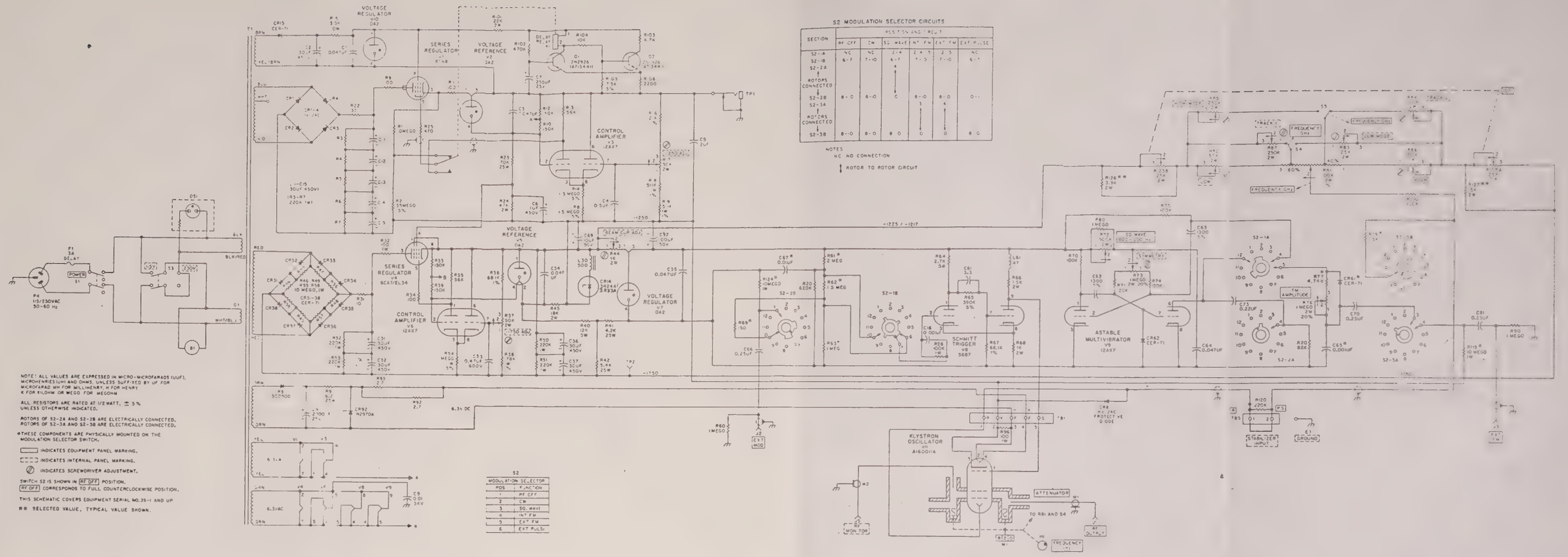


Figure 5-3. Model 1207A Modular Microwave Signal Source, Schematic Diagram

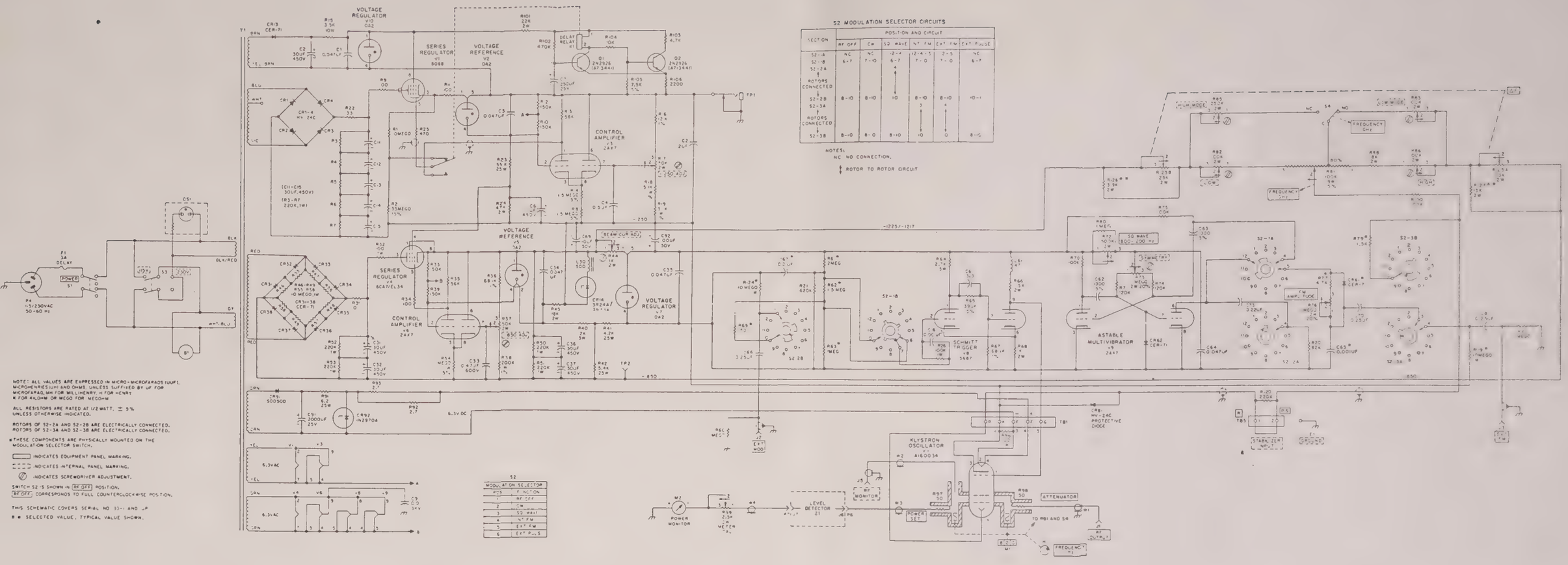

52 MODULATION SELECTOR CIRCUITS
NOTES:
NC NO CONNECTION.
ROTOR TO ROTOR CIRCUIT
NOTE: ALL VALUES ARE EXPRESSED IN MICRO-MICROFARADS (UUF), MICROMEGRIES (UH) AND OHMS, UNLESS SUFFIXED BY UF FOR MICROFARAD, MH FOR MILLIHENRY, H FOR HENRY K FOR KILOHM OR MEGO FOR MEGOHM
ALL RESISTORS ARE RATED AT 1/2 WATT, ± 5% UNLESS OTHERWISE INDICATED.
ROTORS OF S2-2A AND S2-2B ARE ELECTRICALLY CONNECTED. ROTORS OF S2-3A AND S2-3B ARE ELECTRICALLY CONNECTED.
* THESE COMPONENTS ARE PHYSICALLY MOUNTED ON THE MODULATION SELECTOR SWITCH.
INDICATES EQUIPMENT PANEL MARKING.
INDICATES INTERNAL PANEL MARKING.
INDICATES SCREWDRIVER ADJUSTMENT.
SWITCH S2 IS SHOWN IN RF OFF POSITION.
RF OFF CORRESPONDS TO FULL COUNTERCLOCKWISE POSITION.
THIS SCHEMATIC COVERS SERIAL NO 3[illegible] AND UP
SELECTED VALUE. TYPICAL VALUE SHOWN.
VOLTAGE REGULATOR V10 D42
SERIES REGULATOR V1 8068
VOLTAGE REFERENCE V2 D42
CONTROL AMPLIFIER
SERIES REGULATOR V4 6CA7/EL34
VOLTAGE REFERENCE V5 D42
CONTROL AMPLIFIER V6 2AY7
VOLTAGE REGULATOR V7 D42
SCHMITT TRIGGER V8 5687
ASTABLE MULTIVIBRATOR V9 2AY7
KLYSTRON OSCILLATOR V1 A16034
POWER MONITOR
LEVEL DETECTOR Z1
ATTENUATOR
RF OUTPUT
FREQUENCY
POWER SET
RF MONITOR
S2
MODULATION SELECTOR
POSITION
1 RF OFF
2 CW
3 SQ WAVE
4 INT FM
5 EXT FM
6 EXT PULS

Figure 5-4. Model 1208A Modular Microwave Signal Source, Schematic Diagram

TABLE 5-1. VOLTAGE AND RESISTANCE MEASUREMENTS, MODELS 1107A, 1108A, 1207A, AND 1208A

Socket	Tube Type	Pin Numbers									
		1	2	3	4	5	6	7	8	9	
XV1	8068	0	FIL 6.7	1.4	0	-15.5	0	FIL 6.7	160	—	Volts
		∞	130K	100	∞	10MEG	∞	130K	40K	—	Ohms
XV2	0A2	0	-155	0	-155	0	0	-155	—	—	Volts
		0	240K	∞	240K	0	∞	240K	—	—	Ohms
XV3	12AX7	-5.4	-150	-150	FIL	FIL	0	-150	-150	FIL	Volts
		50K	240K	3.5M	135K	135K	1.2	130K	3.5M	135K	Ohms
XV4	EL34	-1240	FIL 6.7	-940	-1010	-1260	0	FIL 6.7	-1240	—	Volts
		340K	410K	750K	280K	800K	∞	400K	325K	—	Ohms
XV5	0A2	-1240	-1390	-1240	-1390	-1240	1210	-1390	—	—	Volts
		370K	325K	380K	325K	380K	∞	320K	—	—	Ohms
XV6	12AX7	-1230	-1370	-1370	-1280	-1280	-1220	-1370	-1370	-1280	Volts
		400K	370K	1.5M	400K	400K	350K	425K	1.5M	400K	Ohms
XV7	0A2	-1280	-1300	-1230	-1400	-1280	-1250	-1400	—	—	Volts
		380K	330K	∞	330K	380K	∞	330K	—	—	Ohms
XV8	5687	-1250	-1340	-1380	FIL 6.5	FIL 6.5	-1380	-1280	FIL 6.5	-1280	Volts
		360K	380K	340K	420K	420K	340K	400K	410K	380K	Ohms
XV9	12AX7	-1280	-1400	-1400	FIL 6.5	FIL 6.5	-1330	-1400	-1400	FIL 6.5	Volts
		480K	1.4MEG	340K	410K	410K	∞	360K	340K	400K	Ohms
XV10	0A2	160	0	0	0	160	0	0	—	—	Volts
		40K	0	330K	0	40K	∞	0	—	—	Ohms
XV11	ZV1011	-1250	-1250 FIL	-1250	-1250 FIL	—	—	—	—	—	Volts
		330K	310K	310K	310K	—	—	—	—	—	Ohms

(CONT'D)

NOTE: 1. FIL denotes 6.3 V AC between pins so marked.
2. Voltage readings taken with a 20,000 ohm/volt VOM between pin and ground.
3. Resistance readings taken with power cable removed.
4. Instrument tuned to high end of band.
5. MODULATION SELECTOR set to RF-OFF.

TABLE 5-1. VOLTAGE AND RESISTANCE MEASUREMENTS, MODELS 1107A, 1108A, 1207A, AND 1208A (CONT'D)

Socket	Transistor Type	Emitter	Collector	Base	
XQ1	A713441 (2N2926)	14	16	15	Volts
XQ2	A713441 (2N2926)	14	30	11	Volts

Note: Voltage readings taken with a 20,000 ohm/volt VOM between pin and ground (after power has been on for at least 2 minutes).

SECTION VI

PARTS LIST

6-1. INTRODUCTION

6-2. This parts list provides an alpha-numerical listing, in reference symbol sequence of the replaceable electrical, certain electro-mechanical, and mechanical parts of the equipment.

6-3. ORDERING INFORMATION. Orders for parts should contain the following information:

a. Equipment name and model.
b. Serial number.
c. Reference symbol of part.
d. Manufacturer's part number and FSC.

6-4. HOW TO USE THE PARTS LIST

6-5. An explanation of the structure of the parts list, Table 6-2, and the meaning of the entries in the five column are given in the following paragraphs, (See Figure 6-1.)

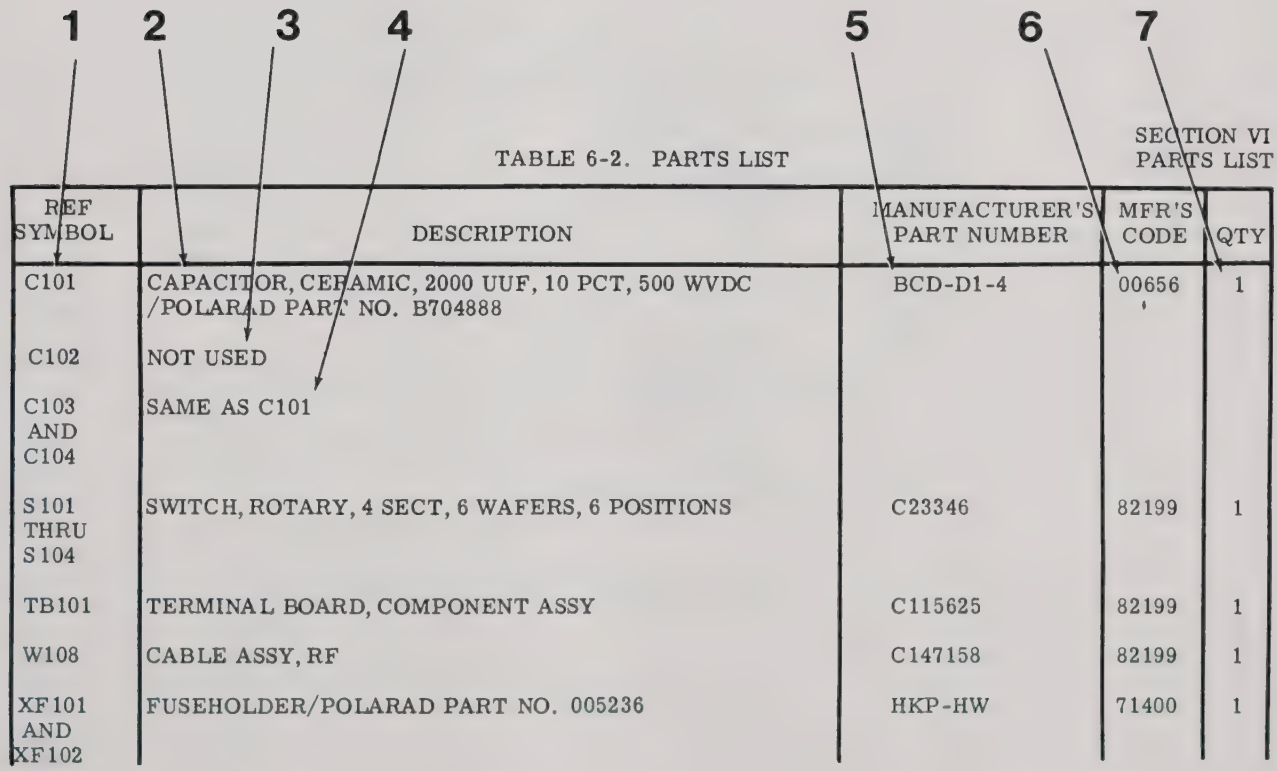


TABLE 6-2. PARTS LIST

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	QTY
C101	CAPACITOR, CERAMIC, 2000 UUF, 10 PCT, 500 WVDC /POLARAD PART NO. B704888	BCD-D1-4	00656	1
C102	NOT USED			
C103 AND C104	SAME AS C101			
S101 THRU S104	SWITCH, ROTARY, 4 SECT, 6 WAFERS, 6 POSITIONS	C23346	82199	1
TB101	TERMINAL BOARD, COMPONENT ASSY	C115625	82199	1
W108	CABLE ASSY, RF	C147158	82199	1
XF101 AND XF102	FUSEHOLDER/POLARAD PART NO. 005236	HKP-HW	71400	1

Figure 6-1. Parts List Example

6-6. REFERENCE SYMBOL COLUMN. The reference symbol column (1, Figure 6-1) contains the reference symbol assigned to each part, which also identifies the part on the schematic diagram or in an illustration. The listing is in alpha-numerical order.

6-7. DESCRIPTION COLUMN. The description column (2) contains the description for each part. When the same part is used more than once in the equipment, the second and subsequent listings for that part use the phrase "SAME AS " (4) in the description column and the remaining columns (5, 6 and 7) are left blank. When a reference symbol designation has not been used or its assignment has been cancelled, the description column contains the phrase "NOT USED" (3).

6-8. MANUFACTURER'S PART NUMBER COLUMN. The manufacturer's part number column (5) contains the part number assigned by the manufacturer of the part, except for "SAME AS" and "NOT USED" listings.

6-9. MANUFACTURER'S CODE (FSC) COLUMN. The manufacturer's code column (6) contains a 5 digit numeric code identifying the manufacturer of the part. Table 6-1 contains a listing of the codes and the manufacturer's names and addresses.

6-10. QUANTITY COLUMN. The quantity column indicates the quantity of each part contained in the respective assembly or subassembly listed as shown in (7).

TABLE 6-1. MANUFACTURER'S CODE

CODE	NAME AND ADDRESS
72136	Electro-Motive Mfg Co. Wilmantic, Conn. 06226
81349	Military Specifications
82199	Polarad Electronics Corporation 5 Delaware Drive Lake Success, N.Y. 11049
84171	Arco Electronics Great Neck, N.Y. 11022
96906	Military Standards

TABLE 6-2. PARTS LIST

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	QTY
	MODELS 1107A AND 1108A SIGNAL GENERATORS AND MODELS 1207A AND 1208A SIGNAL SOURCES			
A1	POWER SUPPLY	E144181	82199	1
A2	FRONT PANEL ASSY, USED ON MODEL 1107A ONLY	D149501	82199	1
A2	FRONT PANEL ASSY, USED ON MODEL 1108A ONLY	D149502	82199	1
A2	FRONT PANEL ASSY, USED ON MODEL 1207A ONLY	D149503	82199	1
A2	FRONT PANEL ASSY, USED ON MODEL 1208A ONLY	D149504	82199	1
A3	COMPONENT ASSY	B148881	82199	1
A4	COMPONENT ASSY	B148882	82199	1
A5	SWITCH AND COMPONENT ASSY, USED ON MODELS 1107A AND 1207A ONLY	B148897	82199	1
A5	SWITCH AND COMPONENT ASSY, USED ON MODELS 1108A AND 1208A ONLY	B159817	82199	1
A6	MODE SWITCH ASSY, USED ON MODELS 1107A AND 1207A ONLY	C148973	82199	1
A6	MODE SWITCH ASSY, USED ON MODELS 1108A AND 1208A ONLY	C148974	82199	1
B1	FAN ASSY, AXIAL, 115 VAC, 80 CPS	B702227	82199	1
CP1	PROBE ASSY, RF, NON-REPLACEABLE PART OF W1, USED ON MODELS 1107A AND 1108A ONLY			
CP1	PROBE ASSY, RF, NON-REPLACEABLE PART OF W1, USED ON MODEL 1207A ONLY			
CP1	PROBE ASSY, RF, NON-REPLACEABLE PART OF W1, USED ON MODEL 1208A ONLY			
CP2	PROBE ASSY, RF, NON-REPLACEABLE PART OF W3, USED ON MODELS 1107A AND 1108A ONLY			
CR1 THRU CR4	SEMICONDUCTOR DEVICE, DIODE	A710668	82199	5
CR5 THRU CR8	NOT USED			
CR9	SEMICONDUCTOR DEVICE, DIODE, SILICON	B707117	82199	12
CR10 THRU CR12	NOT USED			
CR13	SAME AS CR9			
CR14	SEMICONDUCTOR DEVICE, DIODE, ZENER	3R24A/3R33A	81349	1
CR15 THRU CR30	NOT USED			

TABLE 6-2. PARTS LIST (Cont'd)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	QTY
CR31 THRU CR38	SAME AS CR9			
CR39 THRU CR60	NOT USED			
CR61 AND CR62	SAME AS CR9			
CR63 THRU CR80	NOT USED			
CR81	SAME AS CR1			
CR82 THRU CR90	NOT USED			
CR91	SEMICONDUCTOR DEVICE, DIODE	A708488	82199	1
CR92	SEMICONDUCTOR DEVICE, DIODE, ZENER, SILICON	1N2970A	81349	1
C1	CAPACITOR, FILM, 0.047 UF, ±10 PCT, 400 WVDC	C710012	82199	4
C2	CAPACITOR, ELECTROLYTIC, 30 UF, PLUS 50 PCT,	A710604	82199	10
C3	SAME AS C1			
C4	CAPACITOR, PAPER, 0.5 UF, 10 PCT, 1500 WVDC	CP70B1EH504K	81349	1
C5	CAPACITOR, PAPER, 2 UF, 10 PCT, 1500 WVDC	CP70B1EH205K	81349	1
C6	CAPACITOR, ELECTROLYTIC, 1 UF, PLUS 100 PCT	B511350	82199	1
C7	CAPACITOR, ELECTROLYTIC, 250 UF, 25 WVDC	B511247	82199	1
C8	NOT USED			
C9	CAPACITOR, FIXED, CERAMIC, 0.01 UF, 10 PCT, 3 KV	A713454	82199	1
C11 THRU C15	SAME AS C2			
C16	CAPACITOR, FIXED, CERAMIC, 0.001 UF, 5 PCT	B703410	82199	1
C17	NOT USED			
C31 AND C32	SAME AS C2			
C33	CAPACITOR, PAPER, 0.47 UF, 10 PCT, 600 WVDC	A711903	82199	1
C45 AND C35	SAME AS C1			
C36 AND C37	SAME AS C2			
C38 THRU C60	NOT USED			
C61	CAPACITOR, CERAMIC, 3.3 UUF, 10 PCT, 500 WVDC	B701928	82199	1

TABLE 6-2. PARTS LIST (Cont'd)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	QTY
C62 AND C63	CAPACITOR, MICA, 1300 UUF, 5 PCT, 500 WVDC	DM19F132J	72136	2
C64	CAPACITOR, PLASTIC, 0.047 UF, 20 PCT, 200 WVDC	B508724	82199	1
C65	CAPACITOR, MICA, 0.001 UF, 5 PCT, 500 WVDC (MODELS 1107A, 1207A)	B703410	82199	1
C65	CAPACITOR, MICA, 0.01 UF, 5 PCT, 500 WVDC (MODELS 1108A, 1208A)	B703931	82199	1
C66	CAPACITOR, PLASTIC, 0.25 UF, 10 PCT, 200 WVDC	B710291	82199	2
C67	CAPACITOR, CERAMIC, 0.01 UF, 10 PCT, 400 WVDC	C710008	82199	1
C68	NOT USED			
C69	CAPACITOR, ELECTROLYTIC, 10 UF, 50 WVDC	CTA-1160	84171	1
C70	CAPACITOR, PAPER, 0.25 UF, 10 PCT, 600 WVDC	A712094	82199	1
C71 AND C72	NOT USED			
C73	CAPACITOR, FIXED, 0.22 UF, 10 PCT, 125 WVDC	C709997	82199	1
C74 THRU C80	NOT USED			
C81	SAME AS C66			
C82 THRU C90	NOT USED			
C91	CAPACITOR, ELECTROLYTIC, 2000 UF, 25 WVDC	BR200025	84171	1
C92	CAPACITOR, ELECTROLYTIC, 100 UF, 50 WVDC	B511259	82199	1
DS1	LAMP, NEON, 110-125 VAC, RED	A710147	82199	1
E1	BINDING POST	A710389	82199	1
F1	FUSE, CARTRIDGE, DELAY, 3 AMP, 3 AG /POLARAD PART NO. 518127	MS90078-27	96906	1
H1	KNOB	B713439	82199	1
H2	KNOB	B713396	82199	1
H3 AND H4	KNOB	B713395	82199	2
H5	KNOB	B713410	82199	1
H6	SAME AS H5, USED ON MODELS 1107A AND 1108A ONLY			
J1	CONNECTOR, RECEPTACLE, FEMALE, N TYPE, NON-REPLACEABLE PART OF W1, USED ON MODELS 1107A AND 1108A ONLY			

TABLE 6-2. PARTS LIST (Cont'd)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	QTY
J1	CONNECTOR, RECEPTACLE, FEMALE, N TYPE, NON-REPLACEABLE PART OF W1, USED ON MODEL 1207A ONLY			
J1	CONNECTOR, RECEPTACLE, FEMALE, N TYPE, NON-REPLACEABLE PART OF W1, USED ON MODEL 1208A ONLY			
J2 AND J3	CONNECTOR, RECEPTACLE, FEMALE, BNC TYPE	UG-1094/U	81349	2
J4	NOT USED			
J5	CONNECTOR, RECEPTACLE, FEMALE, N TYPE	UG-1095B/U	81349	1
J6	CONNECTOR, RECEPTACLE, MALE, N TYPE, NON-REPLACEABLE PART OF Z1, USED ON MODELS 1107A AND 1108A ONLY			
J7	CONNECTOR, RECEPTACLE, FEMALE, BNC TYPE, NON-REPLACEABLE PART OF Z1, USED ON MODELS 1107A AND 1108A ONLY			
K1	RELAY, ARMATURE, SPDT, 110 VAC	A711101	82199	1
L1 THRU L29	NOT USED			
L30	CHOKE, RF, 500 MH	A711644	82199	1
L31 THRU L60	NOT USED			
L61	CHOKE, RF, 47 MH	A710380	82199	1
MP1	KLYSTRON COVER AND SOCKET ASSY, USED ON MODELS 1107A AND 1207A ONLY	BK50148	82199	1
MP1	KLYSTRON COVER AND SOCKET ASSY, USED ON MODELS 1108A AND 1208A ONLY	B106461	82199	1
MP2 THRU MP10	NOT USED			
MP11	CAP, ELECTRON TUBE	511902	82199	1
M1	COUNTER, ROTATING	A710182	82199	1
M2	METER, PANEL, 0-200 DCUA, USED ON MODELS 1107A AND 1108A ONLY	A710282	82199	1
P1 THRU P3	NOT USED			
P4	CONNECTOR, PLUG, MALE, 3 PINS, WITH CABLE	B701763	82199	1
P5	NOT USED			
P6	CONNECTOR, PLUG, FEMALE, N TYPE, NON-REPLACEABLE PART OF W3, USED ON MODELS 1107A AND 1108A ONLY			
P7	CONNECTOR, PLUG, MALE, BNC TYPE, USED ON MODELS 1107A AND 1108A ONLY	UG-88C/U	81349	1

TABLE 6-2. PARTS LIST (Cont'd)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	QTY
*Q1 AND Q2	TRANSISTOR	A713441	82199	2
R1	RESISTOR, COMPOSITION, 10 MEGO, 10 PCT, 1/2W	RC20GF106K	81349	1
R2	RESISTOR, FILM, 35 MEGO, 15 PCT, 1/2W	A710283	82199	6
R3 THRU R7	RESISTOR, COMPOSITION, 220K, 10 PCT, 1/2W	RC32GF224K	81349	8
R8	RESISTOR, COMPOSITION, 1.5 MEGO, 5 PCT, 1/2W	RC20GF155J	81349	2
R9	RESISTOR, COMPOSITION, 100 OHMS, 10 PCT, 1/2W	RC20GF101K	81349	3
R10	RESISTOR, COMPOSITION, 150K, 10 PCT, 1/2W	RC20GF154K	81349	4
R11	SAME AS R9			
R12	SAME AS R10			
R13	RESISTOR, COMPOSITION, 56K, 10 PCT, 1/2W	RC20GF563K	81349	2
R14	SAME AS R8			
R15	RESISTOR, WW, 3.5K, 10 PCT, 10W	B710047	82199	1
R16	RESISTOR, FILM, 121K, 1 PCT, 1/2W	RN20X1213F	81349	1
R17	RESISTOR, VARIABLE, COMPOSITION, 50K, 10 PCT, 2W	517853	82199	1
R18 AND R19	RESISTOR, FILM, 511K, 1 PCT, 1W	RN25X5113F	81349	1
R20	RESISTOR, COMPOSITION, 82K, 5 PCT, 1/2W	RC20GF823J	81349	1
R21	RESISTOR, COMPOSITION, 620K, 5 PCT, 1/2W	RC20GF624J	81349	1
R22	RESISTOR, COMPOSITION, 33 OHMS, 10 PCT, 1/2W	RC20GF330K	81349	1
R23	RESISTOR, WW, 70K, 10 PCT, 25W (MODEL 1107A, 1207A)	A710045	82199	1
R23	RESISTOR, WW, 55K, 10 PCT, 25W (MODEL 1108A, 1208A)	B710051	82199	1
R24	RESISTOR, COMPOSITION, 47K, 10 PCT, 2W	RC42GF473K	81349	1
R25	RESISTOR, COMPOSITION, 470 OHMS, 10 PCT, 1/2W	RC20GF471K	81349	1
R26	RESISTOR, COMPOSITION, 100K, 5 PCT, 1/2W	RC20GF104J	81349	1
R27 THRU R30	NOT USED			
R31	RESISTOR, COMPOSITION, 10 OHMS, 10 PCT, 1/2W	RC20GF100K	81349	1
R32	RESISTOR, COMPOSITION, 100 OHMS, 10 PCT, 1W	RC32GF101K	81349	2
R33	SAME AS R10			
R34	SAME AS R9			
R35	SAME AS R13			
R36	RESISTOR, FILM, 68.1K, 1 PCT, 1/2W	RN20X6812F	81349	2

*Q1 must show a yellow or green dot. Q2 must show an orange, red or brown dot.

TABLE 6-2. PARTS LIST (Cont'd)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	QTY
R37	RESISTOR, VARIABLE, COMPOSITION, 50K, 10 PCT, 2W	517817	82199	1
R38	RESISTOR, FILM, 178K, 1 PCT, 1W, 1107A, 1207A ONLY	RN25X1783F	81349	1
R38	RESISTOR, FILM, 200K, 1 PCT, 1W, 1108A, 1208A ONLY	RN25X3003F	81349	1
R39	SAME AS R10			
R40	RESISTOR, WW, 12K, 10 PCT, 5W	A710134	82199	1
R41	RESISTOR, WW, 4.2K, 10 PCT, 25W	B710044	82199	1
R42	RESISTOR, WW, 5.4K, 10 PCT, 25W	B710043	82199	1
R43	NOT USED			
R44	RESISTOR, VARIABLE, COMPOSITION, 1K, 10 PCT, 2W	517807	82199	1
R45	RESISTOR, COMPOSITION, 18K, 10 PCT, 2W	RC42GF183K	81349	1
R46 THRU R49	RESISTOR, COMPOSITION, 10 MEGO, 10 PCT, 1W	RC32GF106K	81349	4
R50 THRU R53	SAME AS R3			
R54	RESISTOR, COMPOSITION, 1 MEGO, 5 PCT, 1W	RC32GF105J	81349	1
R55 THRU R58	SAME AS R46			
R59	NOT USED			
R60	RESISTOR, COMPOSITION, 1 MEGO, 10 PCT, 1/2W	RC20GF105K	81349	1
R61	RESISTOR, COMPOSITION, 2 MEGO, 5 PCT, 1/2W	RC20GF205J	81349	1
R62	RESISTOR, COMPOSITION, 1.5 MEGO, 5 PCT, 1/2W	RC20GF155J	81349	1
R63	RESISTOR, COMPOSITION, 1 MEGO, 5 PCT, 1/2W	RC20GF105J	81349	2
R64	RESISTOR, WW, 2.7K, 10 PCT, 5W	A710133	82199	1
R65	RESISTOR, COMPOSITION, 390K, 5 PCT, 1/2W	RC20GF394J	81349	1
R66	RESISTOR, COMPOSITION, 1.5K, 10 PCT, 2W	RC42GF152K	81349	1
R67	SAME AS R36			
R68	RESISTOR, COMPOSITION, 680 OHMS, 5 PCT, 1W	RC32GF104J	81349	1
R69	RESISTOR, COMPOSITION, 150 OHMS, 10 PCT, 1/2W	RC20GF151K	81349	1
R70	RESISTOR, COMPOSITION, 100K, 10 PCT, 1/2W	RC20GF104K	81349	2
R71	RESISTOR, COMPOSITION, 120K, 10 PCT, 1/2W	RC20GF124K	81349	2
R72	RESISTOR, VARIABLE, COMPOSITION, 500K, 10 PCT, 2W	517916	82199	1
R73	RESISTOR, VARIABLE, COMPOSITION, 1 MEGO, 20 PCT, 2W	517940	82199	1

TABLE 6-2. PARTS LIST (Cont'd)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	QTY
R74	SAME AS R71			
R75	SAME AS R70			
R76	RESISTOR, VARIABLE, COMPOSITION, 1 MEGO, 20 PCT, 2W	517918	82199	1
R77	RESISTOR, COMPOSITION, 4.7K, 5 PCT, 1/2W	RC20GF472K	81349	1
R78	NOT USED			
R79	RESISTOR, COMPOSITION, 1.5K, 10 PCT, 1/2W	RC20GF152K	81349	1
R80	SAME AS R63	RC20GF105J	81349	1
R81	RESISTOR, VARIABLE, WW, 100K, 1 PCT, 12W, TAP A-80K, TAP B-60K, TAP C-40K, TAP D-20K, USED ON MODELS 1107A AND 1207A ONLY	005033	82199	1
R81	RESISTOR, VARIABLE, WW, 100K, 5 PCT, 9W, USED ON MODELS 1108A AND 1208A ONLY	B713080	82199	1
R82	RESISTOR, VARIABLE, COMPOSITION, 50K, 10 PCT, 2W, USED ON MODELS 1107A AND 1207A ONLY	517817	82199	1
R82	RESISTOR, VARIABLE, COMPOSITION, 100K, 10 PCT, 2W, USED ON MODELS 1108A AND 1208A ONLY	517901	82199	1
R83	RESISTOR, VARIABLE, COMPOSITION, 25K, 10 PCT, 2W, USED ON MODELS 1107A AND 1207A ONLY	517869	82199	1
R83	RESISTOR, VARIABLE, COMPOSITION, 100K, 10 PCT, 2W, USED ON MODELS 1108A AND 1208A ONLY	517934	82199	1
R84	RESISTOR, VARIABLE, COMPOSITION, 100K, 10 PCT, 2W, USED ON MODELS 1107A AND 1207A ONLY	517934	82199	1
R85	RESISTOR, VARIABLE, COMPOSITION, 250K, 10 PCT, 2W	517903	82199	1
R86	RESISTOR, VARIABLE, COMPOSITION, 100K, 10 PCT, 2W, USED ON MODELS 1108A AND 1208A ONLY	517901	82199	1
R87	RESISTOR, VARIABLE, COMPOSITION, 250K, 10 PCT, 2W, USED ON MODELS 1107A AND 1207A ONLY	517936	82199	1
R88	RESISTOR, COMPOSITION, 18K, 10 PCT, 2W, USED ON MODELS 1108A AND 1208A ONLY	RC42GF183K	82199	1
R89	RESISTOR, COMPOSITION, 22K, 10 PCT, 1W, USED ON MODELS 1108A AND 1208A ONLY	RC32GF223K	82199	1
R90	SAME AS R60			
R91	RESISTOR, WW, 6.2 OHMS, 10 PCT, 25W	B710046	82199	1
R92 AND R93	RESISTOR, COMPOSITION, 2.7 OHMS, 10 PCT, 1/2W	RC20GF2R7K	82199	1
R94 THRU R95	NOT USED			

TABLE 6-2. PARTS LIST (Cont'd)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	QTY
R96	SAME AS R32			
R97	RESISTOR, FILM, 50 OHMS, 10 PCT, 1/2W, NON-REPLACEABLE PART OF W3, USED ON MODELS 1107A AND 1108A ONLY			
R98	RESISTOR, FILM, 50 OHMS, 10 PCT, 1/2W, NON-REPLACEABLE PART OF W1, USED ON MODELS 1107A AND 1108A ONLY			
R99	RESISTOR, VARIABLE, COMPOSITION, 2.5K, 10 PCT, 2W, USED ON MODELS 1107A AND 1108A ONLY	517863	82199	1
R100	SAME AS R70			
R101	RESISTOR, COMPOSITION, 22K, 10 PCT, 2W	RC42GF223K	81349	1
R102	RESISTOR, COMPOSITION, 470K, 10 PCT, 1/2W	RC20GF474K	81349	1
R103	RESISTOR, COMPOSITION, 4.7K, 10 PCT, 1/2W	RC20GF472K	81349	1
R104	RESISTOR, COMPOSITION, 10K, 10 PCT, 1/2W	RC20GF103K	81349	1
R105	RESISTOR, COMPOSITION, 7.5K, 5 PCT, 1/2W	RC20GF752J	81349	1
R106	RESISTOR, COMPOSITION, 2.2K, 10 PCT, 1/2W	RC20GF222K	81349	1
R107 THRU R118	NOT USED			
R119	RESISTOR, COMPOSITION, 10 MEGO, 10 PCT, 1W	RC32GF106K	81349	2
R120	RESISTOR, COMPOSITION, 220K, 5 PCT, 1/2W	RC20GF224J	81349	1
R124	SAME AS R119			
R125	RESISTOR, VARIABLE, DUAL, 25K EA SECT, 10 PCT, 2W	C708860	82199	1
R126	RESISTOR, COMPOSITION, 3.9K, 10 PCT, 2W*	RC42GF392K	81349	1
R127	RESISTOR, COMPOSITION, 15K, 10 PCT, 2W*	RC42GF153K	81349	1
S1	SWITCH, TOGGLE, DPDT	B703121	82199	1
S2	SWITCH, ROTARY, 3 SECT, 6 WAFERS, 6 POSITION	B710362	82199	1
S3	SWITCH, SLIDE, DPDT	A709936	82199	1
S4	SWITCH, SENSITIVE, SPDT	AN3234-1	81349	1
TB1	TERMINAL BOARD	542005	82199	1
TB2	TERMINAL BOARD, COMPONENT ASSY	C148503	82199	1
TB3	TERMINAL BOARD, COMPONENT ASSY	C148504	82199	1
TB4	TERMINAL BOARD, COMPONENT ASSY, USED ON MODEL 1107A ONLY	C148930	82199	1

*Nominal value. Actual value selected in test.

TABLE 6-2. PARTS LIST (Cont'd)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	QTY
TB4	TERMINAL BOARD, COMPONENT ASSY, USED ON MODEL 1108A ONLY	C148931	82199	1
TB4	TERMINAL BOARD, COMPONENT ASSY, USED ON MODEL 1207A ONLY	C149350	82199	1
TB4	TERMINAL BOARD, COMPONENT ASSY, USED ON MODEL 1208A ONLY	C149349	82199	1
TB5	TERMINAL BOARD	A710390	82199	1
TB6	NOT USED			
TB7	COMPONENT ASSY	B151472	82199	1
TB8 THRU TB10	NOT USED			
TB11	COMPONENT ASSY	B155003	82199	1
TP1	JACK, TEST POINT, TELEPHONE TYPE	JJ-089	81347	1
TP2	JACK, TEST POINT, PIN TYPE	B711277	82199	1
T1	TRANSFORMER, POWER	B151057	82199	1
V1	ELECTRON TUBE	8068	81349	1
V2	ELECTRON TUBE	0A2	81349	4
V3	ELECTRON TUBE	12AX7	81349	3
V4	ELECTRON TUBE	6CA7/EL34	81349	1
V5	SAME AS V2			
V6	SAME AS V3			
V7	SAME AS V2			
V8	ELECTRON TUBE	5687	81349	1
V9	SAME AS V3			
V10	SAME AS V2			
V11	ELECTRON TUBE, KLYSTRON, USED ON MODELS 1107A AND 1207A ONLY	A160011A	82199	1
V11	ELECTRON TUBE, KLYSTRON, USED ON MODEL 1108A ONLY	A160034	82199	1
V11	ELECTRON TUBE, KLYSTRON, USED ON MODEL 1208A ONLY	A160035	82199	1
W1	CABLE AND PROBE ASSY, RF, USED ON MODELS 1107A AND 1108A ONLY	C149009	82199	1
W1	CABLE AND PROBE ASSY, RF, USED ON MODEL 1207A ONLY	C149250	82199	1

TABLE 6-2. PARTS LIST (Cont'd)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	QTY
W1	CABLE AND PROBE ASSY, RF, USED ON MODEL 1208A ONLY	C149251	82199	1
W2	CABLE AND PROBE ASSY, RF, USED ON MODELS 1107A AND 1207A ONLY	A149167	82199	1
W2	CABLE AND PROBE ASSY, RF, USED ON MODELS 1108A AND 1208A ONLY	A149252	82199	1
W3	CABLE AND PROBE ASSY, RF, USED ON MODELS 1107A AND 1108A ONLY	C149010	82199	1
W4	CABLE ASSY, USED ON MODELS 1107A AND 1108A ONLY	A149151	82199	1
XF1	FUSEHOLDER	005626	82199	1
XV1	SOCKET, ELECTRON TUBE	A710153	82199	2
XV2	SOCKET, ELECTRON TUBE	A710040	82199	5
XV3	SOCKET, ELECTRON TUBE	B709864	82199	3
XV4	SAME AS XV1			
XV5 THRU XV7	SAME AS XV2			
XV8 AND XV9	SAME AS XV3			
XV10	SAME AS XV2			
Z1	DETECTOR, CRYSTAL, RF, 1-12.5 Hz, USED ON MODELS 1107A AND 1108A ONLY	A149576	82199	1

TABLE 6-2. PARTS LIST (Cont'd)

REF SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR'S CODE	QTY
	SUPPLIED ACCESSORIES			
A7	ACCESSORY KIT	B149182	82199	1
A8	WRENCH KIT	A25109	82199	1
CP3	CONNECTOR, ADAPTER, 3 TO 2 PINS, BLACK	A131966	82199	1
MP2	WRENCH, SPANNER	A15550	82199	1
MP3	WRENCH, SPLINE	515101	82199	1
MP4	WRENCH, SPLINE	515102	82199	1
MP5	WRENCH, SPLINE	515103	82199	1
MP6	WRENCH, SPLINE	515104	82199	1
MP7	WRENCH, ALLEN	515301	82199	1
MP8	WRENCH, ALLEN	515302	82199	1
MP9	WRENCH, ALLEN	515303	82199	1
MP10	WRENCH, ALLEN	515304	82199	1
P8 AND P9	CONNECTOR, PLUG, MALE, N TYPE	UG-21D/U	81349	1
P10 AND P11	CONNECTOR, PLUG, MALE, BNC TYPE	UG-88/U	81349	1
W5	CABLE ASSY, RF, RG-9B/U	B12551	82199	1
W6	CABLE ASSY, VIDEO, RG-58/U	B12553	82199	1

polarad electronic instruments

A DIVISION OF POLARAD ELECTRONICS CORP
5 DELAWARE DRIVE LAKE SUCCESS, NEW YORK, 11040 516-328-1100

REQUEST FOR MAINTENANCE

FROM:

COMPANY NAME _____ DATE: _____

ADDRESS: _____ INDIVIDUAL _____

_____ POSITION _____

SECTION OR DIVISION _____ PHONE NO. _____ EXT. _____

_____

EQUIPMENT _____ DATE OF PURCHASE _____

MODEL _____ SERIAL NO. _____ ORDER NO. _____

_____

TROUBLE REPORT:

A. Description of trouble _____

_____

_____

_____

_____

_____

B. Has trouble been localized? _____ If so, how and where: _____

_____

_____

_____

_____

_____

C. Instruments used and measurements taken, if any: _____

_____

_____

_____

D. Is trouble intermittent? _____

E. Hours of operation prior to this trouble _____

F. Date trouble occurred _____

G. Was factory consulted by telephone or letter prior to this request? _____

If so, give date and person to whom directed: _____

_____

H. Additional Comments: _____

_____

_____

_____

_____

_____

_____

When trouble develops requiring factory assistance, complete this form and send to:

Polarad Electronic Instruments
Division of
Polarad Electronics Corporation
5 Delaware Drive
Lake Success, New York 11040
ATTENTION: Service Department

After this report has been analyzed by the Service Department, you will be notified when a field service engineer will call on you to make the necessary repairs. If your trouble can best be corrected at the factor we will so notify you with instructions and authorization for returning the equipment.

NO EQUIPMENT MAY BE RETURNED TO THE FACTORY WITHOUT WRITTEN AUTHORIZATION

MP MASTER
MA34812

ROHDE&SCHWARZ
polarad

5 Delaware Dr.. Lake Success, New York 11042 (516) 328-1100 TWX: 510-223-0414

SE Laboratories
LOC: JJ4
MAN-07556